THE IRON AGE

A Review of the Hardware, Iron, Machinery and Metal Trades.

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THE IRON AGE

New York, Thursday, December 6, 1906.

A Vertical Lever Punch and a Vertical Lever Shear.

The accompanying illustrations, Figs. 1 and 2, show a vertical lever punch and vertical lever shear of English type. These were furnished the Great Lakes Engineering Works, Detroit, Mich., by the United Engineering & Foundry Company, Pittsburgh, Pa., and are about the first built in this country.

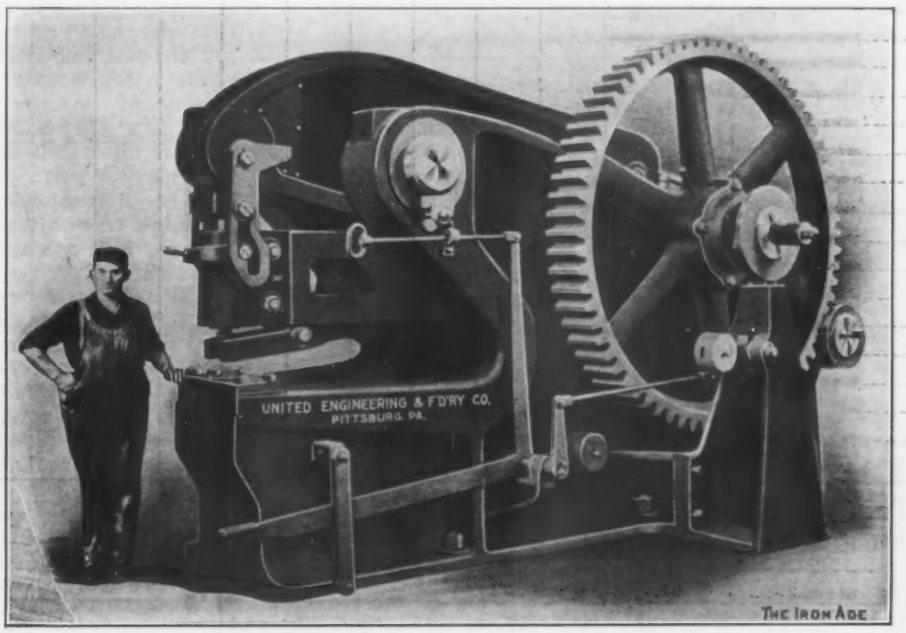


Fig. 1.—Vertical Lever Punch, English Type, Built by the United Engineering & Foundry Company, Pittsburgh, Pa.

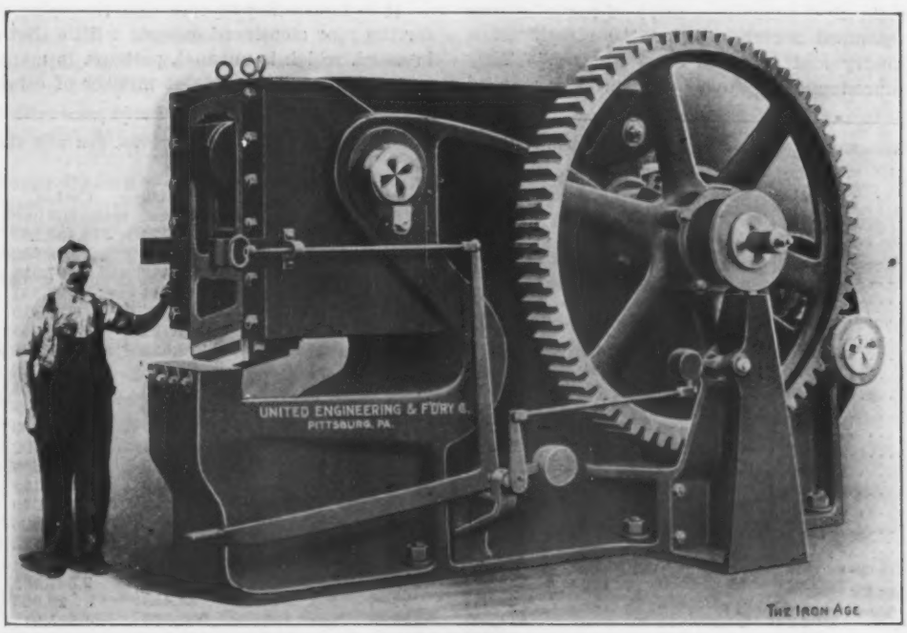


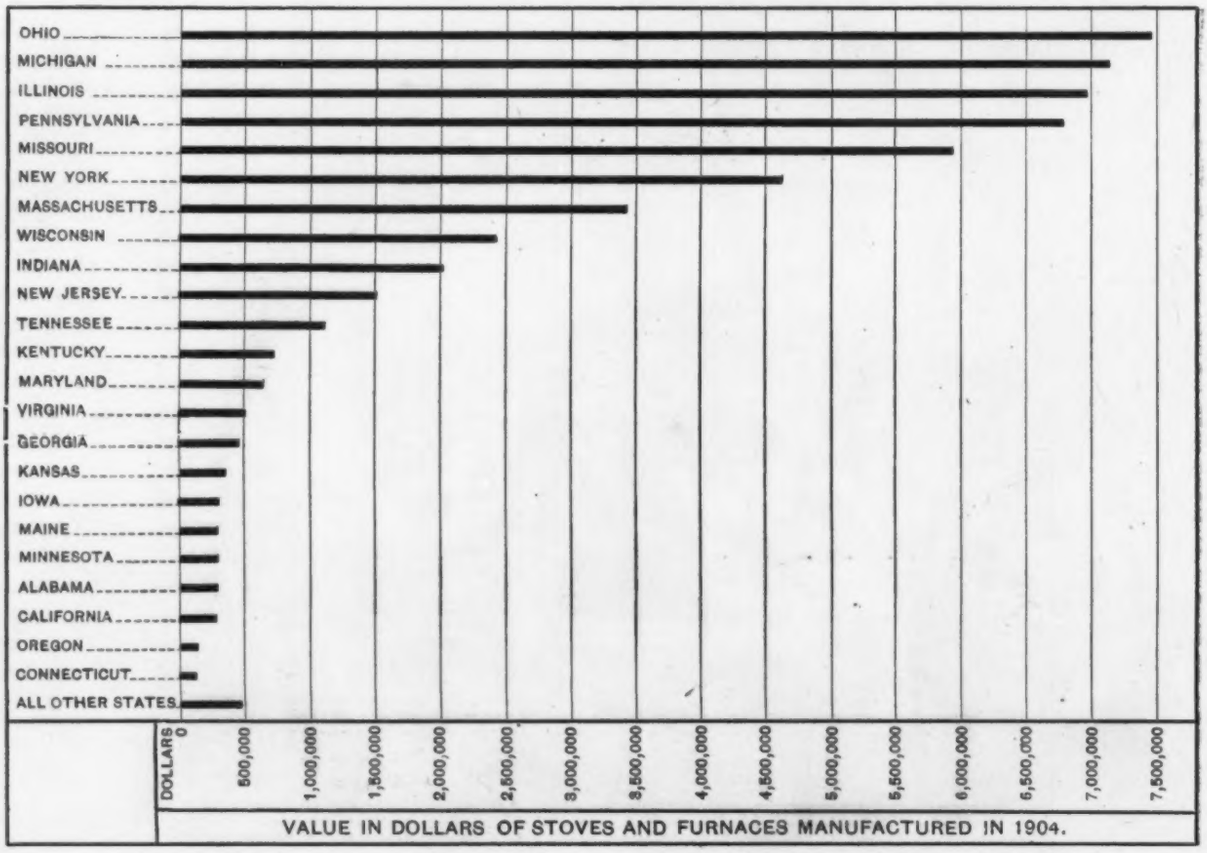
Fig. 2.—Vertical Lever Shear, English Type, Built by the United Engineering & Foundry Company, Pittsburgh, Pa.

They are very powerful machines and of very massive construction, as can be seen by comparison with the men standing beside them. The levers are of cast steel, as are also the gearing, brackets, &c., while the main housing is of cast iron. These machines are built in all sizes. The punch illustrated is capable of punching a 1½-in. hole in a 1½-in. plate, while the shear is capable of shearing a 1½-in. plate. The knives on the shear are 24 in. long. The weight of each machine is 70,000 lb. The length of each is 16 ft. over all and the width 8 ft. The main gears have a 9-in. face.

These machines are especially adapted for shipyards and structural shops, where large and cumbersome plates are handled, as there is no overhead gearing nor does any part of the machine interfere with traveling crane chains. They also permit the operator to stand close to the work and so have better control of the machine. All the shafting, pins, &c., are of forged steel, made of ample size, while most of the bearings are brass-bushed, as are also the sliding heads.

A Census of Stove and Furnace Manufactures.

The statistics of stove and furnace manufactures have, in the United States Industrial Census of 1904, been separated for the first time from those of manufactures formerly all grouped together under the classification, "General Foundry and Machine Shop Figures." They show that the production of stoves and furnaces reached nearly $7,500,000. Besides the figures for the value of output, the table shows also the number of establishments, capital invested in plants, the amounts of salaries, labor, cost of material and other expenses and charges, and finally the total value of the product.



COMPARATIVE VALUES BY STATES OF PRODUCTS OF STOVE AND FURNACE MANUFACTURERS IN 1904.

It is interesting to note that the value of the product for the year mentioned exceeds a little that of the capital invested, which is unusual, perhaps, in manufacturing establishments. The greatest number of establishments located in any one State is in Ohio, where there are 82, and the value of production is, as before mentioned, the greatest of any State. Illinois ranks second with 57 establishments, but in the value of products Michigan stands second in value the total of $54,409,108 for the year, and from them have been prepared the accompanying chart and the accompanying table. The chart indicates the total values of the products by States, with Ohio in the lead with

TABULAR STATEMENT OF MANUFACTURES OF STOVES AND FURNACES, NOT INCLUDING GAS AND OIL STOVES, FOR THE YEAR 1904.

States.	Number of establishments.	Capital.	Salaried officials, clerks, &c. Number.	Salaried officials, clerks, &c. Salaries.	Wage earners. Average number.	Wage earners. Wages.	Miscellaneous expenses.	Cost of materials used.	Value of products.
United States	415	$52,971,105	3,206	$4,031,908	29,728	$17,823,434	$6,790,676	$18,483,865	$54,409,108
Alabama	7	183,701	18	17,315	175	124,887	16,743	78,936	283,197
California	7	156,381	15	12,705	167	90,190	9,089	97,535	279,450
Connecticut	3	106,332	9	9,328	75	45,319	15,111	23,141	121,431
Georgia	7	348,483	34	38,380	279	185,281	43,694	119,015	461,868
Illinois	57	6,183,531	387	471,016	3,562	2,150,907	1,101,122	2,314,315	6,957,542
Indiana	23	1,703,877	131	163,701	1,070	588,547	238,633	807,363	2,029,841
Iowa	11	276,462	34	25,637	134	71,625	37,118	126,120	309,960
Kansas	3	385,900	35	41,440	206	111,264	55,756	132,803	371,105
Kentucky	7	726,249	44	56,620	540	344,611	55,229	201,918	720,250
Maine	4	382,185	24	37,844	207	117,599	41,590	71,863	304,268
Maryland	5	703,872	53	58,040	349	195,561	64,764	196,792	646,451
Massachusetts	16	2,532,578	158	228,447	1,372	938,604	240,589	1,560,683	3,437,554
Michigan	21	5,126,019	393	513,937	3,980	2,283,705	960,230	2,378,198	7,112,874
Minnesota	10	298,218	41	41,130	109	58,768	28,653	101,549	303,856
Missouri	22	5,004,450	337	536,260	2,147	1,462,372	716,831	2,085,826	5,932,498
New Jersey	4	958,069	54	131,137	665	564,972	190,914	439,766	1,517,665
New York	35	5,447,337	342	409,179	2,413	1,574,453	655,315	1,546,869	4,631,838
Ohio	82	7,224,592	428	486,794	5,204	2,908,540	823,806	2,547,459	7,457,128
Oregon	3	213,552	14	22,244	30	25,500	35,458	20,325	139,000
Pennsylvania	53	10,130,871	379	411,503	4,220	2,503,420	930,076	1,915,213	6,794,165
Tennessee	10	1,158,263	53	60,092	819	404,292	103,196	348,737	1,115,889
Virginia	4	474,497	32	44,106	299	185,823	62,687	180,986	537,258
Wisconsin	11	2,591,149	165	184,494	1,359	665,652	322,362	1,051,663	2,444,667
All other States*	10	654,537	26	30,559	347	221,542	41,710	136,790	499,353

* Includes establishments distributed as follows: Colorado, 1; Mississippi, 1; New Hampshire, 2; Rhode Island, 1; South Dakota, 1; Vermont, 1; Washington, 1; West Virginia, 2.

ond with $7,112,000. The center of production, also the place of greatest production, has long been considered as the Middle West, and it is interesting to note that nearly half the production, or, to be exact, $23,557,385, is made in the four contiguous States—Ohio, Indiana, Illinois and Michigan. The original intention of the Census Bureau was to separate completely the value of the different classes of stoves and furnaces, such as the total production of steel stoves and ranges, cast iron stoves and ranges, oak stoves, heating stoves, tabulating in all about 30 separate schedules. The Department prepared blanks and a printed schedule, sent to stove manufacturers. The scope of the information desired aroused some objections and a detailed analysis of conditions was abandoned by the Director of the Census. The causes are explained in the following extract of a letter from the statistician of the Department of Commerce and Labor:

"A supplemental schedule for the manufacture of stoves and furnaces was printed and sent to all of the stove manufacturers. However, a number of the principal manufacturers located in Quincy, Ill., joined in a protest to the Director of the Census against the use of this schedule. They contended that the information was of no general interest to the public, and also to fill the schedule properly would inflict a hardship on stove manufacturers generally. In reply to this protest the Director advised the manufacturers as follows:

"'Referring to my previous correspondence with you in regard to the special schedule prepared by this office for the stove manufacturer, I now beg to say that I have been presented with a statement addressed to L. B. Boswell of Quincy, and signed by all the stove manufacturers of that city, requesting the abandonment of this special schedule in connection with the approaching census of manufactures, and after going carefully over the ground with Mr. Boswell, I have notified him that the schedule will be withdrawn, and have requested him to so inform the Quincy stove manufacturers. This office has no desire to attempt the collection of any statistics regarding manufactures which the manufacturers themselves agree in saying cannot be of any benefit to their industry.'

"Therefore the special schedule was abandoned and no statistics other than those covered by the general report on manufactures, as indicated by the inclosed table, have been compiled for the industry."

The statistics have necessarily taken into account a number of manufacturers of stoves or ranges whose entire equipment was not strictly devoted to the manufacture of these products, as is shown by the large number of establishments—namely, 415.—*The Metal Worker.*

The Pressed Radiator Company.—On October 4 the Kinnear Pressed Radiator Company took action at a regular meeting looking toward the change of its name to the Pressed Radiator Company. The company is now operating under the new name, and is manufacturing sheet steel radiators for house heating at West Pittsburgh, Pa. The plant is modern in every detail. It is equipped throughout with automatic machinery operated entirely by electricity. The building is 600 ft. long and includes 54,000 ft. of floor space. It is of steel and concrete construction, but one story in hight, and much attention was devoted to the securing of the best possible light and ventilation. The headquarters of the company are located in commodious offices in the Bailey-Farrell Building, Pittsburgh, and branches have been established in different cities as follows: New York, Flatiron Building; Chicago, First National Bank Building; St. Louis, S. H. Brooks & Co., 312 South Eighth street; Kansas City, Heist Building; Toronto, Ont., 302 Queen street; London, England, 19-21 Tower street; Upper St. Martin's lane; Seattle, 408 Occidental avenue; Indianapolis, State Life Building; Oakland, 922 Franklin street; Detroit, Buhl Building; San Antonio, Moore Building; Minneapolis, 407 Boston Block; Milwaukee, 69 Second street.

The third annual convention of the Northwestern Cement Production Association will be held at St. Paul, Minn., January 16. There will be on exhibit at the convention all cement productions, as well as operating machinery.

An Important Bankruptcy Decision.

WASHINGTON, D. C., December 4, 1906.—The United States Supreme Court has handed down a decision under the Federal bankruptcy law, which should be examined with special care by all business men, whether of the debtor or creditor class. The decision of the Court sustains the action of the Court below in permitting a bank to retain a bankrupt's entire deposit as an offset to its claim, notwithstanding the fact that the bankrupt's estate was not sufficient to pay 100 cents on the dollar. In other words, the bank is not required to turn the deposit over to the trustees and to share it with other creditors, but may keep the whole of it and present a claim for the remainder of the debt due it by the bankrupt, receiving on that account a proportionate share of the dividends from the estate.

The Supreme Court, however, lays down another equally important proposition in deciding this case—namely, that the so-called General Orders in Bankruptcy promulgated by the United States Supreme Court have all the force of law and make it necessary for all appeals to the Supreme Court from any court of bankruptcy to be taken within 30 days after the filing of the judgment or decree appealed from. This provision of the rules has been very generally ignored by the courts below, and as a result trustees in bankruptcy in many cases have sacrificed the rights of the creditors whom they represent. In deciding this case the Supreme Court says:

> The law provides that appeals shall be taken "within such time as may be prescribed by the Supreme Court of the United States," and by General Order XXXVI this court prescribed the time and limited it to 30 days, in harmony with the policy of the bankruptcy act, requiring prompt action and the avoidance of delay. The limitation has the same effect as if written in the statute, and the allowance of an appeal on certificate cannot operate as an adjudication that it is taken in time. The present appeal was allowed four months "after the judgment of decree" appealed from and three months after the time to appeal had expired.
>
> But it is said that the limitation should be referred to the date of the order denying the petition for rehearing, and the trustee prayed an appeal from that order as well as from the judgment. No appeal lies from orders denying petitions for rehearing, which are addressed to the discretion of the court and designed to afford it an opportunity to correct its own errors. Appellant might have made his application for rehearing and had it determined within the 30 days, and still have had time to take his appeal. But he let the 30 days expire, as it did February 22, 1905, and did not file his petition until May 8, 1905. The right of appeal had then been lost and appellant could not reinvest himself with that right by filing a petition for rehearing.
>
> The cases cited for appellant, in which it was held that an application for a rehearing, made before the time for appeal had expired, suspended the running of the period for taking an appeal, are not applicable when that period had already expired. "When the time for taking an appeal has expired it cannot be arrested or called back by a simple order of court. If it could be, the law which limits the time within which an appeal can be taken would be a dead letter." Credit Company, Limited, vs. Arkansas Central Railway Company, 128 U. S., 258, 261.

Counsel for the trustee in this case suggested in his argument that as there is but one term of the Circuit Court of Appeals, and as the rules of practice of that court permit petitions for rehearing to be presented at any time during the term, therefore this rule of practice operated to enlarge the limitation of the Bankruptcy act, but the Supreme Court dismissed this contention with the terse declaration that it was "without merit."

W. L. C.

At the shipyard of the Delaware River Iron Shipbuilding & Engine Works, Chester, Pa., December 1, the turbine passenger steamship Yale of the Metropolitan Steamship Line was successfully launched. The hull will be towed to the works of the W. & A. Fletcher Company, Hoboken, N. J., where triple turbine engines of 10,000 hp. will be installed and the steamship completed. It is intended for the outside line between New York and Boston. The Harvard, a sister steamship, will shortly be launched at the same shipyard. These steamships are designed to be the fastest in the coastwise service of the United States, the expectation being that they will make 23 knots. The dimensions of these boats are 407 ft. over all, 63 ft. in breadth over guards and draft 16 ft.

THE ART OF CUTTING METALS*.

BY FRED W. TAYLOR, PHILADELPHIA, PRESIDENT AMERICAN SOCIETY MECHANICAL ENGINEERS.

The experiments described in this paper were undertaken to obtain a part of the information necessary to establish in a machine shop our system of management, the central idea of which is: (A) To give each workman each day in advance a definite task, with detailed written instructions, and an exact time allowance for each element of the work. (B) To pay extraordinarily high wages to those who perform their tasks in the allotted time, and ordinary wages to those who take more than their time allowance. There are three questions which must be answered each day in every machine shop by every machinist who is running a metal cutting machine, such as a lathe, planer, drill press, milling machine, &c., namely:

a. What tool shall I use?
b. What cutting speed shall I use?
c. What feed shall I use?

Our investigations, which were started 26 years ago with the definite purpose of finding the true answers to these questions under all the varying conditions of machine shop practice, have been carried on up to the present time with this as the main object still in view.

Roughing Work Exclusively Considered.

The writer will confine himself almost exclusively to an attempted solution of this problem as it affects "roughing work;" *i. e.*, the preparation of the forgings or casting for the final finishing cut, which is taken only in those cases where great accuracy or high finish is called for. Fine finishing cuts will not be dealt with. Our principal object will be to describe the fundamental laws and principles which will enable us to do "roughing work" in the shortest time, whether the cuts are light or heavy, whether the work is rigid or elastic and whether the machine tools are light and of small driving power, or heavy and rigid with ample driving power. In other words, our problem is to take the work and machines as we find them in a machine shop and by properly changing the countershaft speeds, equipping the shop with tools of the best quality and shapes and then making a slide rule for each machine to enable an intelligent mechanic with the aid of these slide rules to tell each workman how to do each piece of work in the quickest time.

It may seem strange to say that a slide rule enables a good mechanic to double the output of a machine which has been run, for example, for 10 years by a first-class machinist having exceptional knowledge of and experience with his machine and who has been using his best judgment. Yet our observation shows that, on the average, this understates the fact. To make the reason for this more clear it should be understood that the man with the aid of his slide rule is called upon to determine the effect which each of the 12 elements or variables given below has upon the choice of cutting speed and feed; and it will be evident that the mechanic, expert or mathematician does not live who, without the aid of a slide rule or its equivalent, can hold in his head these 12 variables and measure their joint effect upon the problem. These 12 elements or variables are as follows:

a. The quality of the metal which is to be cut.
b. The diameter of the work.
c. The depth of the cut.
d. The thickness of the shaving.
e. The elasticity of the work and of the tool.
f. The shape or contour of the cutting edge of the tool, together with its clearance and lip angles.
g. The chemical composition of the steel from which the tool is made, and the heat treatment of the tool.
h. Whether a copious stream of water, or other cooling medium, is used on the tool.
j. The duration of the cut—*i. e.*, the time which a tool must last under pressure of the shaving without being reground.
k. The pressure of the chip or shaving upon the tool.
l. The changes of speed and feed possible in the lathe.
m. The pulling and feeding power of the lathe.

Broadly speaking, the problem of studying the effect of each of the above variables upon the cutting speed and of making this study practically useful may be divided into four sections, as follows:

(A) The determination by a series of experiments of the important facts or laws connected with the art of cutting metals.

(B) The finding of mathematical expressions for these laws which are so simple as to be suited to daily use.

(C) The investigation of the limitations and possibilities of metal cutting machines.

(D) The development of an instrument (a slide rule) which embodies, on the one hand, the laws of cutting metals, and on the other the possibilities and limitations of the particular lathe or planer, &c., to which it applies, and which can be used by a machinist without mathematical training to quickly indicate in each case the speed and feed which will do the work quickest and best.

The Experiments Begun in 1880.

In the fall of 1880 the machinists in the small machine shop of the Midvale Steel Company, Philadelphia, most of whom were working on piecework in machining locomotive tires, car axles, and miscellaneous forgings, had combined to do only a certain number of pieces per day on each type of work. The writer, who was the newly appointed foreman of the shop, realized that it was possible for the men to do in all cases much more work per day than they were accomplishing. He found, however, that his efforts to get the men to increase the output were blocked by the fact that his knowledge of just what combination of depth of cut, feed and cutting speed would in each case do the work in the shortest time was much less accurate than that of the machinists who were combined against him. His conviction that the men were not doing half as much as they should do, however, was so strong that he obtained the permission of the management to make a series of experiments to investigate the laws of cutting metals, with a view to obtaining a knowledge at least equal to that of the combined machinists who were under him. He expected that these experiments would last not longer than six months. With the exception of a few comparatively short periods, however, these experiments have continued until the present time, through a term of about 26 years.

The writer wishes to call attention to the fact that in these first experiments he was far more fortunate than almost all of the experimenters who have investigated the subject since then, in having at his disposal a comparatively large mass of uniform metal to work upon, and a comparatively large and powerful machine to work with, a 66-in. diameter boring mill and large locomotive tires made of hard tire steel of uniform quality having been used. He was also especially fortunate in having over him as president of the company William Sellers, who, as is well known, was one of the most patient and broad minded experimenters of his day. Mr. Sellers, in spite of the protests which were made against the continuation of this work, allowed the experiments to proceed, even, at first, at a very considerable inconvenience and loss to the shop.

The extent of this inconvenience will be appreciated when it is understood that we were using a 66-in. diameter vertical boring mill, belt driven by the usual cone pulleys, and that in order to regulate the exact cutting speed of the tool it was necessary to slow down the speed of the engine that drove all of the shafting in the shop, a special adjustable engine governor having been bought for this purpose. For over two years the whole shop was inconvenienced in this way, by having the speed of its main line of shafting greatly varied, not only from day to day but from hour to hour. Before the two years had elapsed, however, the writer had obtained such valuable and unexpected results from the experiments as to much more than justify all of the annoyance and expenditure, and soon after that he readily obtained permission to em-

* Extracts from Part I of the president's annual address at the New York meeting (December, 1906) of the American Society of Mechanical Engineers.

ploy a young technical graduate to devote his whole time to the continuation of this work.

Acknowledgments to Those Who Assisted in the Work.

G. M. Sinclair, a graduate of Stevens Institute of Technology, devoted his entire time to this work from 1884 to 1887, when he left the employ of the company. H. L. Gantt, also a graduate of Stevens Institute, succeeded Mr. Sinclair in July, 1887, and has been interested with us in carrying on these experiments throughout their whole period. In 1898 Maunsel White of Bethlehem, another graduate of Stevens Institute, joined us and has been actively interested in our work up to this time. Carl G. Barth, a graduate of the Technical School of Horten, Norway, joined us in 1899, and is still actively working on our investigations.

During these years we have consulted so freely together in all matters relating to these experiments that with few exceptions hardly a step has been taken which can be said to have originated with any one man. Therefore, whatever credit or blame may come to this work should be impartially divided among us. In writing this paper, then, no effort will be made to discriminate, as to the results which have been obtained in our investigations, between the work of one man and another.

In addition to the five men who have mainly directed and carried on this work the writer wishes to acknowledge the most loyal and efficient aid and co-operation of many others who have assisted in the actual running of the machines and in recording or tabulating the data. Among these he would particularly mention Dwight V. Merrick, D. C. Fenner, James Kellogg, Sidney Newbold, Joseph Welden, N. W. Wickersham, Edward Kneisley, and Leonard G. Backstrom.

Our experiments were continued in the works of the Midvale Steel Company until 1889, when the writer left its employ. Since then these investigations have been carried on in various shops and at the expense of different companies. Among these we would especially acknowledge our indebtedness to the Cramp's Shipbuilding Company, Wm. Sellers & Co., the Link-Belt Engineering Company, Dodge & Day, and, more than all, to the Bethlehem Steel Company.

In carrying on this work more than 10 machines have been fitted up at various times with special driving apparatus and the other needed appliances, all machines used since 1894 having been equipped with electric drives, so as to obtain any desired cutting speed. The thoroughness with which the work has been done may perhaps be better appreciated when it is understood that we have made between 30,000 and 50,000 recorded experiments, and many others of which no record was kept. In studying these laws we have cut up into chips with our experimental tools more than 800,000 lb. of steel and iron. More than 16,000 experiments were recorded in the Bethlehem Steel Company. We estimate that up to date between $150,000 and $200,000 have been spent upon this work, and it is a very great satisfaction to feel that those whose generosity has enabled us to carry on the experiments have received ample return for their money through the increased output and the economy in running their shops which have resulted from our experiments.

Secrets Guarded 26 Years Now Revealed.

Throughout the whole 26 years we have succeeded in keeping almost all of these laws secret, and in fact since 1889 this has been our means of obtaining the money needed to carry on the work. We have never sold any information connected with this art for cash, but we have given to one company after another all of the data and conclusions arrived at through our experiments in consideration for the opportunity of still further continuing our work. In one shop after another machines have been fitted up for our use, workmen furnished us to run them, and especially prepared tools, forgings and castings supplied in exchange for the data which we had obtained to date; and we have the best indication that they received full value for the money spent from the fact that the same company fitted up for us at intervals of several years three sets of apparatus, the additional knowledge obtained each time evidently warranting them in making the added outlay.

During this period all of the companies who were given this information, and all of the man who worked upon the experiments, were bound by promises to the writer not to give any of this information away nor to allow it to be published. Most of these promises were verbal; and in this day, when there is so much talk about dishonesty and graft in connection with some of our corporations and prominent business men, it is a notable fact that through a period of 26 years it has not come to our knowledge that any one of the many men or companies connected with this work has broken a promise. The writer has his doubts whether any other country can produce a parallel record of such widespread good faith among its engineers and mechanics.

It seems to us that the time has now come for the engineering fraternity to have the results of our work, in spite of the fact that this will cut off our former means of financing the experiments. However, we are in hopes that the money required to complete this work may be obtained from some other source.

The writer has no doubt that many of the discoveries and conclusions which mark the progress of this work have been and are well known to other engineers, and we do not record them with any certainty that we were the first to discover or formulate them, but merely to indicate some of the landmarks in the development of our own experiments, which to us were new and of value. The following is a record of some of our more important steps:

Chronology of Discoveries.

A. In 1881, the discovery that a round nosed tool could be run under given conditions at a much higher cutting speed and therefore turn out much more work than the old-fashioned diamond pointed tool.

B. In 1881, the demonstration that, broadly speaking, the use of coarse feeds accompanied by their necessarily slow cutting speeds would do more work than fine feeds with their accompanying high speeds.

C. In 1883, the discovery that a heavy stream of water poured directly upon the chip at the point where it is being removed from the steel forging by the tool, would permit an increase in cutting speed, and, therefore, in the amount of work done of from 30 to 40 per cent. In 1884 a new machine shop was built for the Midvale Steel Works, in the construction of which this discovery played a most important part; each machine being set in a wrought iron pan in which was collected the water (supersaturated with carbonate of soda to prevent rusting), which was thrown in a heavy stream upon the tool for the purpose of cooling it. The water from each of these pans was carried through suitable drain pipes beneath the floor to a central well from which it was pumped to an overhead tank from which a system of supply pipes led to each machine. Up to that time the use of water for cooling tools was confined to small cans or tanks from which only a minute stream was allowed to trickle upon the tool and the work, more for the purpose of obtaining a water finish on the work than with the object of cooling the tool; and, in fact, these small streams of water are utterly inadequate for the latter purpose. So far as the writer knows, in spite of the fact that the shops of the Midvale Steel Works until recently have been open to the public since 1884, no other shop in this country was similarly fitted up until that of the Bethlehem Steel Company in 1899, with the one exception of a small steel works which was an offshoot in personnel from the Midvale Steel Company.

D. In 1883, the completion of a set of experiments with round nosed tools; first, with varying thicknesses of feed when the depth of the cut was maintained constant; and, second, with varying depths of cut while the feed remained constant, to determine the effect of these two elements on the cutting speed.

E. In 1883, the demonstration of the fact that the longer a tool is called upon to work continuously under pressure of a shaving, the slower must be the cutting speed, and the exact determination of the effect of the duration of the cut upon the cutting speed.

F. In 1883, the development of formulæ which gave mathematical expression to the two broad laws above referred to. Fortunately these formulæ were of the type capable of logarithmic expression and therefore suited to the gradual mathematical development extending through a long period of years, which resulted in making our slide rules and solved the whole problem in 1901.

G. In 1883, the experimental determination of the pressure upon the tool required on steel tires to remove cuts of varying depths and thickness of shaving.

H. In 1883, the starting of a set of experiments on belting described in a paper published in *Transactions*, Vol. 15 (1894).

J. In 1883, the measurement of the power required to feed a round nosed tool with varying depths of cut and thickness of shaving when cutting a steel tire. This experiment showed

that a very dull tool required as much pressure to feed it as to drive the cut. This was one of the most important discoveries made by us, and as a result all steel cutting machines purchased since that time by the Midvale Steel Company have been supplied with feeding power equal to their driving power and very greatly in excess of that used on standard machine tools.

K. In 1884, the design of an automatic grinder for grinding tools in lots and the construction of a toolroom for storing and issuing tools ready ground to the men.

L. From 1885 to 1889, the making of a series of practical tables for a number of machines in the shops of the Midvale Steel Company, by the aid of which it was possible to give definite tasks each day to the machinists who were running machines, and which resulted in a great increase in their output.

M. In 1886, the demonstration that the thickness of the chip or layer of metal removed by the tool has a much greater effect upon the cutting speed than any other element, and the practical use of this knowledge in making and putting into everyday use in our shops a series of broad nosed cutting tools which enabled us to run with a coarse feed at as high a speed as has been before attained with round nosed tools when using a fine feed, thus substituting, for a considerable portion of the work, coarse feeds and high speeds for our old maxim of coarse feeds and slow speeds.

N. In 1894 and 1895, the discovery that a greater proportional gain could be made in cutting soft metals through the use of tools made from self-hardening steels than in cutting hard metals, the gain made by the use of self-hardening tools over tempered tools in cutting soft cast iron being almost 90 per cent., whereas the gain in cutting hard steels or hard cast iron was only about 45 per cent. Up to this time the use of Mushet and other self-hardening tools had been almost exclusively confined to cutting hard metals, a few tools made of Mushet steel being kept on hand in every shop for special use on hard castings or forgings which could not be cut by the tempered tools. This experiment resulted in substituting self-hardening tools for tempered tools for all "roughing work" throughout the machine shop.

P. In 1894 and 1895, the discovery that in cutting wrought iron or steel a heavy stream of water thrown upon the shaving at the nose of the tool produced a gain in cutting speed of self-hardening tools of about 33 per cent. Up to this time the makers of self-hardening steel had warned users never to use water on the tools.

Q. From 1898 to 1900, the discovery and development of the Taylor-White process of treating tools; namely, the discovery that tools made from chromium-tungsten steels when heated to the melting point would do from two to four times as much work as other tools.

R. In 1899-1902, the development of our slide rules, which are so simple that they enable an ordinary workman to make practical and rapid everyday use in the shop of all the laws and formulæ deduced from our experiments.

S. In 1906, the discovery that a heavy stream of water poured directly upon the chip at the point where it is being removed from cast iron by the tool would permit an increase in cutting speed, and therefore in the amount of work done, of 16 per cent.

T. In 1906, the discovery that by adding a small quantity of vanadium to tool steel to be used for making modern high speed chromium-tungsten tools heated to near the melting point, the hardness and endurance of tools, as well as their cutting speeds, are materially improved.

The Gain from the Slide Rule Greatest of All.

While many of the results of these experiments are both interesting and valuable, we regard as of by far the greatest value that portion of our experiments and of our mathematical work which has resulted in the development of the slide rules—*i. e.*, the patient investigation and mathematical expression of the exact effect upon the cutting speed of such elements, as the shape of the cutting edge of the tool, the thickness of the shaving, the depth of the cut, the quality of the metal being cut and the duration of the cut, &c. This work enables us to fix a daily task with a definite time allowance for each workman who is running a machine tool, and to pay the men a bonus for rapid work.

The gain from these slide rules is far greater than that of all the other improvements combined, because it accomplishes the original object for which in 1880 the experiments were started—*i. e.*, that of taking the control of the machine shop out of the hands of the many workmen and placing it completely in the hands of the management, thus superseding "rule of thumb" by scientific control.

By far the most difficult and illusive portion of this work has been the mathematical side: First, finding simple formulæ which expressed with approximate accuracy the effect of each of the numerous variables upon the cutting speed, and, second, finding a rapid method of using these formulæ in the solution of the daily machine shop problems. Several times during the progress of this mathematical work the writer, feeling himself completely baffled, has asked the expert assistance of some of the best mathematicians in the country. They all smiled when told that we expected to solve mathematically a problem containing 12 variables, and in each case, after keeping the formulæ before them for a longer or shorter time, returned the problem to the writer with the statement that it belonged distinctly in the realm of "rule of thumb" or empiricism, and could be solved only by the slow method of trial and error.

Two Types of Experiments.

In the investigation of an art such as that of cutting metals, and about which at the time our work was started there was so little scientific knowledge, two types of experiments are possible:

First, the thoroughly scientific type, in which, after an analysis of all the variable elements which affect the final result, an attempt is made to hold all of the elements constant and uniform except the one variable which is under investigation, and this one is systematically changed and its effect upon the problem carefully noted. It is to this type that our experiments belong, thanks mainly to the fact that William Sellers (one of the most scientific experimenters of his day) was president of the Midvale Steel Company when the writer started his work.

Second, the type of experiments in which the effect of two or more variables upon the problem is investigated at the same time and in the same experiment. This method is of course much quicker than the thoroughly scientific type, and it is largely for this reason, in the opinion of the writer, that almost all of the other experimenters in this field have chosen it. Several of the experiments of this type have proved most valuable and developed much useful information, and it is with hesitancy that the writer criticises the work of any of these experimenters, since he appreciates most keenly the difficulties under which they worked, and is grateful for the information contributed by them to the art.

Almost the whole course of our experiments is marked by imperfections in our methods, which, as we have realized them, have led us to go again more carefully over the ground previously traveled. These errors may be divided into three principal classes: (A) The adoption of wrong or inadequate standards for measuring the effect of each of the variables upon the cutting speed. (B) Failure on our part from various causes to hold all of the variables constant except the one which was being systematically changed in order to study the effect of these changes upon the cutting speed. (C) The omission either through oversight or carelessness on our part of some one of the precautions which should be taken to insure accuracy, or failure to record some of the phenomena considered unimportant at the time, but which afterward proved to be essential to a complete understanding of the facts.

Effect of Each Variable on Cutting Speed.

The effect of each variable upon the problem is best determined by finding the exact rate of cutting speed (say, in feet per minute) which shall cause the tool to be completely ruined after having been run for 20 min. under uniform conditions.

For example, if we wish to investigate the effect which a change in the thickness of the feed has upon the cutting speed it is necessary to make a number of tools which are in all respects uniform as to the exact shape of their cutting edge, their clearance and lip angles, their chemical composition and their heat treatment. These tools must then be run one after another, each for a period of 20 min., throughout which time the cutting speed is maintained exactly uniform. Each tool should be run at a little faster cutting speed than its predecessor, until that cutting speed has been found which will cause the tool to be completely ruined at the end of 20 min. (with an allowance of a minute or two each side of the 20-min. mark). In this way that cutting speed is found which corresponds to the particular thickness of shaving which is under investigation.

A change is then made in the thickness of the shaving

and another set of 20-min. runs is made, with a series of similar uniform tools, until the cutting speed corresponding to the new thickness of feed has been determined; and by continuing in this way all of the cutting speeds are found which correspond to the various changes of feed. In the meantime every precaution must be taken to maintain uniform all the other elements or variables which affect the cutting speed, such as the depth of the cut and the quality of the metal being cut; and the rate of the cutting speed must be frequently tested during each 20-min. run to be sure that it is uniform.

The cutting speeds corresponding to varying feeds are then plotted as points upon a curve, and a mathematical expression is found which represents the law of the effect of feed upon cutting speed. We believe that this standard or method of procedure constitutes the very foundation of successful investigation in this art, and it is from this standpoint that we propose to criticise both our own experiments and those made by other investigators.

It was only after about 14 years' work that we found that the best measure for the value of a tool lay in the exact cutting speed at which it was completely ruined at the end of 20 min. In the meantime we had made one set of experiments after another as we successively found the errors due to our earlier standards, and realized and remedied the defects in our apparatus and methods; and we have now arrived at the interesting though rather humiliating conclusion that, with our present knowledge of methods and apparatus, it would be entirely practicable to obtain through four or five years of experimenting all of the information which we have spent 26 years in getting. The following are some of the more important errors made by us:

Finding Out What to Avoid.

We wasted much time by testing tools for a shorter cutting period than 20 min., and then having found that tools which were apparently uniform in all respects gave most erratic results (particularly in cutting steel) when run for a shorter period than 20 min. we erred in the other direction by running our tools for periods of 30 or 40 min. each, and in this way used up in each single experiment so much of the forging that it was impossible to make enough experiments in cutting metal of uniform quality to get conclusive results. We finally settled on a run of 20 min. as being the best all round criterion, and have seen no reason for modifying this conclusion up to date.

We next thought a proper criterion for judging the effect of a given element upon the cutting speed lay in determining the particular cutting speed which would just cause a tool to be slightly discolored below the cutting edge at the end of the 20 min. After wasting six months in experimenting with this as our standard we found that it was not a true measure, and then adopted as a criterion a certain definite dulling or rubbing away of the cutting edge. Later it was found, however, that each thickness of feed had corresponding to it a certain degree of dullness or injury to the cutting edge at which point regrinding was necessary (the thicker the shaving the duller the tool should be before grinding), and a third series of experiments was made with this as a standard. While experimenting on light forgings a standard dullness of tool was used which was just sufficient to push the forging and tool apart and so slightly alter the diameter of the work. All of these criterions were discarded, however, when in 1894 we finally hit upon the true standard, above described, of completely ruining the tool in 20 min. This standard demands both a very large and expensive machine to experiment with, and also large, heavy masses of metal to work upon, which is unfortunate; but we believe without apparatus and methods of this kind it is out of the question accurately to determine the laws which are sought. Experiments upon the art of cutting metals (at least those experiments which have been recorded) have been mainly undertaken by scientific men, mostly by professors. It is but natural that the scientific man should lean toward experiments which require the use of apparatus and that type of scientific observation which is beyond the scope of the ordinary mechanic, or even of engineers unless they have been especially trained in this kind of observation. It is perhaps for this reason more than any other that in this art several of those elements which are of the greatest importance have received no attention from experimenters, while far less fruitful, although more complicated elements have been the subject of extended experiments. As an illustration of this fact we would call attention to two of the most simple of all of the elements which have been left entirely untouched by all experimenters—namely:

a. The effect of cooling the tool through pouring a heavy stream of water upon it, which results in a gain of 40 per cent. in cutting speed.

b. The effect of the contour or outline of the cutting edge of the tool upon the cutting speed, which when properly designed results in an equally large percentage of gain.

Both of these elements can be investigated at comparatively small cost and with comparatively simple apparatus, while that element which has received chief attention from experimenters—namely, the pressure of the chip on the tool—calls for elaborate and expensive apparatus and is almost barren of useful results. This should be a warning to all men proposing to make experiments in any field, first, to look thoroughly over the whole field and at least carefully consider all of the elements from which any practical results may be expected, and then to select the more simple and elementary of these and properly investigate them before engaging in the more complicated work.

Notable Experiments by Others.

The most notable experiments in this art that have come to the writer's attention are those made at Manchester, England, during the years 1902 and 1903. All these experiments were made jointly by eight of the most prominent English manufacturing companies, among whom were Armstrong, Whitworth & Co., Vickers' Sons & Maxim, John Brown & Co., Thomas Firth & Sons, and others, who combined with the Manchester Association of Engineers and the Manchester Municipal School of Technology, the latter being principally represented by Dr. J. T. Nicholson, who made the final report entitled "Experiments With a Lathe Tool Dynamometer," published in *Transactions*, Vol. 25. In 1901 a committee of the Verein Deutscher Ingenieure (Union of German Engineers), together with the managers of some of the larger engineering works in Berlin, made an interesting series of experiments which was published September 28, 1901, in the *Zeitschrift des Verein Deutscher Ingenieure*, and on November 15, 1905, there were published in Bulletin No. 2 of the University of Illinois, experiments made by Prof. L. P. Breckinridge and Henry B. Dirks.

The work of all these men belongs to the second type of experiments above referred to, in which the joint effect of two or more variables is studied at the same time. In the case of the Manchester experiments, the work appears to have been, to a considerable extent, a test as to the all round knowledge in the art of cutting metals possessed by eight of the prominent English firms. These firms each presented tools made from their own tool steel, treated their own way, and ground to whatever shapes and angles the particular company considered would do the largest amount of work. Each company was allowed to have one guess on each of the qualities of metal worked upon, with each change of feed and depth of cut, as to the cutting speed at which they believed their tool would do the most work. If, under this cutting speed, the tool failed to hold out throughout the stipulated period of time, they were then given no opportunity to find the exact cutting speed at which the tool would do its best work. And, on the other hand, in those cases in which a tool did good work throughout its specified period of time no effort was made to find how much faster it could have run and still do good work. Great variety was shown in the shapes of the tools used in the experiments, yet no effort was made to definitely determine which make of tool steel or which shape of the tool was best, or even in case a tool did exceptionally good work no effort was made to determine whether this was due to

the shape of the tool or to the quality and treatment of the tool steel.

Discoveries Made Which Were Not Looked For.

It is a noteworthy fact that when thorough investigations are attempted by earnest men in new fields, while frequently the object aimed at is not attained, yet quite often discoveries are made which are entirely foreign to the purpose for which the investigation was undertaken. And it may be said that the indirect results of careful scientific work are, generally speaking, fully as valuable as the direct. Two interesting illustrations of this fact have been furnished by our experiments.

The discovery of the Taylor-White process of treating tools by heating them almost to the melting point, or, in other words, the introduction of modern high speed tools the world over, was the indirect result of one of our lines of investigation. The demonstration of the fact that the rules for using belting in common practice furnished belts which were entirely too light for economy was also one of the indirect results of our experiments. The manner of making these discoveries was each time in a way so typical of what may be expected in similar cases that it would seem worth while to describe it in some detail.

During the winter of 1894-1895, the writer conducted an investigation in the shop of Wm. Sellers & Co., at the joint expense of William Cramp & Sons, shipbuilders, and Wm. Sellers & Co., to determine which make of self-hardening tool steel was, on the whole, the best to adopt as standard for all of the roughing tools of these two shops.

As a result of this work the choice was narrowed down at that time to two makes of tool steel: (1) the celebrated Mushet self-hardening steel, the chemical composition of the particular bar analyzed at this time showing tungsten, per cent., 5.441, chromium 0.398, carbon 2.150, manganese 1.578, silicon 1.044, no phosphorus and no sulphur; and (2) a self-hardening steel made by the Midvale Steel Company, having tungsten, per cent., 7.723, chromium 1.830, carbon 1.143, manganese 0.180, silicon 0.246, phosphorus 0.023 and sulphur 0.008.

Of these two steels the tools made from the Midvale steel were shown to be capable of running at rather higher cutting speeds. The writer himself heated hundreds of tools of these makes in the course of his experiments in order to determine accurately the best temperatures for forging and heating them prior to grinding, so as to get the best cutting speeds. In these experiments he found that the Mushet steel if overheated crumbled badly when struck even a light blow on the anvil, while the Midvale steel if overheated showed no tendency to crumble, but, on the other hand, was apparently permanently injured. In fact, heating these tools slightly beyond a bright cherry red caused them permanently to fall down in their cutting speeds, and the writer was unable at that time to find any subsequent heat treatment which would resore a tool broken down in this way to its original good condition. This defect in the Midvale tools left us in doubt as to whether the Mushet or the Midvale was, on the whole, the better to adopt as a shop standard.

Heat Treatment Experiments.

In the summer of 1898, soon after undertaking the reorganization of the management of the Bethlehem Steel Company, the writer decided to continue the experiments just referred to, with a view to ascertaining whether in the meanwhile some better tool steel had not been developed. After testing several additional makes of tools our experiments indicated that the Midvale self-hardening tools could be run, if properly heated, at slightly higher speeds than those of any other make.

Upon deciding to adopt this steel as our standard the writer had a number of tools of each make of steel carefully dressed and ground to exactly the same shape. He then called the foremen and superintendents of the machine shops of the Bethlehem Steel Company to the experimental lathe so that they could be convinced by seeing an actual trial of all of the tools that the Midvale steel was, on the whole, the best. In this test, however, the Midvale tools proved to be worse than those of any other make; *i. e.*, they ran at slower cutting speeds. This result was rather humiliating to us as experimenters who had spent several weeks in the investigation.

It was of course the first impression of the writer that these tools had been overheated in the smith shop. Upon careful inquiry among the smiths, however, it seemed as though they had taken special pains to dress them at a low heat, although the matter was left in much doubt. The writer, therefore, determined to make a thorough investigation before finally adopting the Midvale steel as our shop standard, to discover if possible some heat treatment which would restore Midvale tools injured in their heating (whether they had been underheated or overheated) to their original good condition.

For this purpose Mr. White and the writer started a carefully laid out series of experiments, in which tools were to be heated at temperatures increasing, say, by about 50 degrees all the way from a black heat to the melting point. These tools were then to be ground and run in the experimental lathe upon a uniform forging, so as to find:

a. That heat at which the highest cutting speed could be attained (which our previous experiments had shown to be a cherry red);

b. To determine accurately the exact danger point at which if over or underheated these tools were seriously injured;

c. To find some heat treatment by which injured tools could be restored to their former high cutting speeds.

Heating Tools Close to the Melting Point.

These experiments corroborated our Cramp-Sellers experiments, showing that the tools were seriously broken down or injured by overheating say, somewhere between 1500 degrees F. and 1700 degrees F.; but to our great surprise tools heated up to or above the high heat of 1725 degrees F. proved better than any of those heated to the best previous temperature, namely, a bright cherry red; and from 1725 degrees F. up to the incipient point of fusion of the tools, the higher they were heated the higher the cutting speeds at which they would run.

Thus, the discovery that phenomenal results could be obtained by heating tools close to the melting point, which was so completely revolutionary and directly the opposite of all previous heat treatment of tools, was the indirect result of an accurate scientific effort to investigate as to which brand of tool steel was, on the whole, the best to adopt as a shop standard, neither Mr. White nor the writer having the slightest idea that overheating beyond the bright cherry red would do anything except injure the tool more and more the higher it was heated.

Heavy Belts Found Desirable.

During our early Midvale Steel Company experiments, extending from 1880 to 1883, the writer had so much trouble in maintaining the tension of the belt used in driving the boring mill upon which he was experimenting that he concluded: (1) That belting rules in common use furnished belts entirely too light for economy; and (2) that the proper way to take care of belting was to have each belt in a shop tightened at regular intervals with belt clamps especially fitted with spring balances, with which the tension of the belt was accurately weighted every time it was tightened, each belt being retightened each time to exactly the same tension.

In 1884 the writer designed and superintended the erection of a new machine shop for the Midvale Steel Company, and this gave him the opportunity to put these conclusions to a practical test. About half the belts in the shop were designed according to the ordinary rules and the other half were made about three times as heavy as the usual standard. This shop ran day and night. The belts were in all cases cared for and retightened only upon written orders sent from the shop office; and an accurate record was kept through nine years of all items of interest concerning each belt, namely, the number of hours lost through interruption to manufacture; the number of times each belt interrupted manufacture; the original cost of each belt; the detail costs of tightening, cleaning and repairing each belt; the fall in the tension before requiring retightening; and the time each belt would run without being retightened. Thus at the end of nine years these belts furnished a record which demon-

strated beyond question many important facts connected with the use of belting, the principal of these being that the ordinary rules gave belts only about one-half as heavy as should be used for economy.* This belting experiment illustrates again the good that often comes indirectly from experiments undertaken in an entirely different field.

Shop Management.

After many years of close personal contact with our mechanics I have great confidence in their good judgment and common sense in the long run, and I am proud to number many of them among my most intimate friends. As a class, however, they are extremely conservative, and if left to themselves their progress from the older toward better methods will be exceedingly slow. And my experience is that rapid improvement can only be brought about through constant and heavy pressure from those who are over them. It must be said, therefore, that to get any great benefit from the laws derived from these experiments our slide rules must be used, and these slide rules will be of but little, if any, value under the old style of management, in which the machinist is left with the final decision as to what shape of tool, depth of cut, speed and feed he will use. The slide rules cannot be left at the lathe to be banged about by the machinist. They must be used by a man with reasonably clean hands, and at a table or desk, and this man must write his instructions as to speed, feed, depth of cut, &c., and send them to the machinist well in advance of the time that the work is to be done. Even if these written instructions are sent to the machinist, however, little attention will be paid to them unless rigid standards have been not only adopted, but enforced, throughout the shop for every detail, large and small, of the shop equipment, as well as for all shop methods. And further, but but little can be accomplished with these laws unless the old style foreman and shop superintendent have been done away with and functional foremanship has been substituted—consisting of speed bosses, gang bosses, order-of-work men, inspector, time study men, &c. In fact, the correct use of slide rules involves the substitution of our whole task system of management for the old style management, as described in our paper on "Shop Management" (*Transactions*, Vol. 24). This involves such radical, one might almost say revolutionary, changes in the mental attitude and habits, both of the workmen and of the management, and the danger from strikes is so great and the chances for failure are so many, that such a reorganization should only be undertaken under the direct control (not advice but control) of men who have had years of experience and training in introducing this system.

Machine Shop Output Can Be Doubled.

A long time will be required in any shop to bring about this radically new order of things; but in the end the gain is so great that I say without hesitation that there is hardly a machine shop in the country whose output cannot be doubled through the use of these methods. And this applies not only to large shops, but also to comparatively small establishments. In a company whose employees all told, including officers and salesmen, number about 150 men, we have succeeded in more than doubling the output of the shop, and in converting an annual loss of 20 per cent. upon the old volume of business into an annual profit of more than 20 per cent. upon the new volume of business, and at the same time rendering a lot of disorganized and dissatisfied workmen contended and hard working, by insuring them an average increase of about 35 per cent. in their wages. And I take this opportunity of again saying that those companies are indeed fortunate who can secure the services of men to direct the introduction of this type of management who have had sufficient training and experience to insure success.*

Unfortunately those fundamental ideas upon which the new task management rests mainly for success are directly antagonistic to the fundamental ideas of the old type of management. To give two out of many examples: Under our system the workman is told minutely just what he is to do and how he is to do it; and any improvement which he makes upon the orders given him is fatal to success. While, with the old style, the workman is expected constantly to improve upon his orders and former methods, under our system any improvement, large or small, once decided upon goes into immediate use and is never allowed to lapse or become obsolete, while under the old system the innovation unless it meets with the approval of the mechanic (which it never does at the start) is generally for a long time, at least, a positive impediment to success. Thus many of those elements which are mainly responsible for the success of our system are failures and a positive clog when grafted on the old system.

For this reason the really great gain which will ultimately come from the use of these slide rules will be slow in arriving—mainly, as explained, because of the revolutionary changes needed for their successful use—but it is sure to come in the end.

Standardization Means Simplification.

Too much emphasis cannot be laid upon the fact that standardization really means simplification. It is far simpler to have in a standardized shop two makes of tool steel than to have 20 makes of tool steel, as will be found in shops under the old style of management. It is far simpler to have all of the tools in a standardized shop ground by one man to a few simple but rigidly maintained shapes than to have, as is usual in the old style shop, each machinist spend a portion of each day at the grindstone, grinding his tools with radically wrong curves and cutting angles, merely because bad shapes are easier to grind than good. Hundreds of similar illustrations could be given showing the true simplicity (not complication) which accompanies the new type of management.

There is, however, one element in which the new type of management to all outward appearance is far more complicated than the old—namely, no standards and no real system of management can be maintained without the supervision, and, what is more, the hard work of men who would be called by the old style of management supernumeraries or nonproducers. The man who judges of the complication of his organization only by looking over the names of those on the payroll and separating the so-called nonproducers from the producers, finds the new style of management more complicated than the old.

No one doubts for one minute that it is far simpler to run a shop with a boiler, steam engine, shafting, pulleys and belts than it would be to run the same shop with the old fashioned foot power, yet the boiler, steam engine, shafting, pulleys and belts require, as supernumeraries or nonproducers on the payroll, a fireman, an engineer, an oiler and often a man to look after belts. The old style manager, however, who judges of complication only by comparing the number of nonproducers with that of the producers, would find the steam engine merely a complication in management. The same man, to be logical, would find the whole drafting force of an engineering establishment merely a complication, whereas in fact it is a great simplification over the old method.

A Human Managing Machine Needed.

Now our whole system of management is quite accurately typified by the substitution of an elaborate engine to drive and control the shop in place of the old fashioned foot power. There is no question that our human managing machine, which is required for the maintenance and the effective use of both standard shop details and standard methods throughout the establishment, calls for many more nonproducers than are used with the old style management, having its two or three foremen and a super-

* The writer presented a paper to this society in 1893 (published in *Transactions*, Vol. 15) upon this series of experiments. He has since found, however, that in the minds of many readers the value of the conclusions arrived at have been seriously brought into question, largely through the criticism of one man, which at the time appeared to the writer so ridiculous that he made the mistake of thinking it not worth answering in detail. This should be a warning to writers to answer carefully all criticisms, however foolish.

* The writer feels free to give this advice most emphatically without danger of having his motives misinterpreted, since he has himself given up accepting professional engagements in this field.

intendent. The efficiency of our engine of management, however, compared with the old single foreman, is like a shop engine as compared with foot power, or the drafting room as compared with having the designing done by the pattern maker, blacksmith and machinist.

A study of the recommendations made throughout this paper will illustrate the fact that we propose to take all of the important decisions and planning, which vitally affect the output of the shop, out of the hands of the workmen and centralize them in a few men, each of whom is especially trained in the art of making those decisions and in seeing that they are carried out, each man having his own particular function in which he is supreme, and not interfering with the functions of other men.

Independent Motors Criticised.

There is one recommendation, however, in modern machine shop practice, in making which the writer will probably be accused of being old fashioned or ultra conservative. Of late years there has been what may be almost termed a blind rush on the part of those who have wished to increase the efficiency of their shops toward driving each individual machine with an independent motor. The writer is firmly convinced through large personal observation in many shops and through having himself systematized two electrical works that in perhaps three cases out of four a properly designed belt drive is preferable to the individual motor drive for machine tools. There is no question that through a term of years the total cost, on the one hand, of individual motors and electrical wiring, coupled with the maintenance and repairs of this system, will far exceed the first cost of properly designed shafting and belting plus maintenance and repairs (in most shops entirely too light belts and countershafts of inferior design are used, and the belts are not systematically cared for by one trained man, and this involves a heavy cost for maintenance).

It is at last admitted that there is little, if any, economy in power obtainable through promiscuous motor driving, and it will certainly be found to be a safe rule not to adopt an individual motor for driving any machine tool unless clearly evident that a large saving can be made by it.

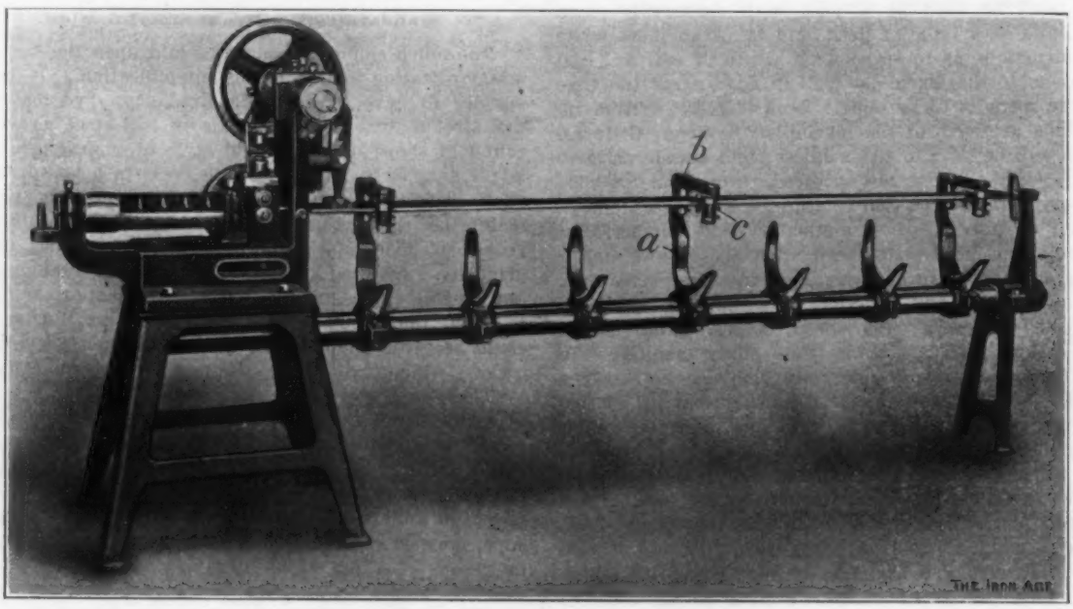
An Era of True Co-operation.

In concluding let me say that we are now but on the threshold of the coming era of true co-operation. The time is fast going by for the great personal or individual achievement of any one man standing alone and without the help of those around him. And the time is coming when all great things will be done by the co-operation of many men, in which each man performs that function for which he is best suited, each man preserves his own individuality and is supreme in his particular function and each man at the same time loses none of his originality and proper personal initiative and yet is controlled by and must work harmoniously with many other men.

And let me point out that the most important lessons taught by these experiments, particularly to the younger men, are: Several men when heartily co-operating, even if of everyday caliber, can accomplish what would be next to impossible for any one man, even of exceptional ability. Expensive experiments can be successfully carried on by men without money, and the most difficult mathematical problems can be solved by very ordinary mathematicians, providing only that they are willing to pay the price in time, patience and hard work. The old adage is again made good, that all things come to him who waits, if only he works hard enough in the meantime.

The Nilson Wire Straightening Machine.

The improved wire straightening and cutting-off machine here shown contains several important improvements which have recently been added by its builder, the A. H. Nilson Machine Company, Bridgeport, Conn. A notable change is in the supporting device of the guide bar, which permits the latter to be quickly reversed so that it may be grooved on both sides, making possible the handling of two sizes of wire with the same bar. Another new feature is the opening in the frame which enables the bottom roll to be adjusted much more easily and quickly. The legs, pipe and guide bar are removable, which makes possible the concentration of the machine and its parts into small, compact space for shipment. This is exceedingly desirable in making shipments to foreign countries.



The Improved Nilson Wire Straightening Machine.

As regards the guide bar each bracket, *a*, supports two pins, *b*, each having a lever, *c*, supported between two collars for holding the bar in place. The guide bar is connected with a pin on the top of the lever in such a manner that it swings easily and freely. To set the machine for another size of wire it is only necessary to remove the pins and reverse the guide bar, bringing the other grooves into position.

This machine, while designed primarily for straightening wire and cutting it into long lengths, can be adjusted for cutting any length shorter than the extreme of its capacity, but is not recommended for continuous use in cutting short pieces. The machine is made lighter than its predecessor in the company's line, but it is strong in every way, is easy to operate and makes no noise when the parts of the guide bar go together.

It is built in these sizes: 1-16, ⅛, 3-16, ¼, ⅜, ½ and ⅝ in., each machine being capable of working many smaller sizes of wire than that indicated by its size by having the necessary feeding and cutting tools.

Great Northern Ore Land Earnings.

Now that the Great Northern Railway Company has issued its statement to shareholders relative to their rights in its ore lands on the Mesaba range and that certificates representing this interest are to be issued, equal in number to the share capital of the railroad, it is interesting to review a few facts connected therewith, and to inquire into the value to holders of this most remarkable division of accumulations.

A Wholesome Example in High Finance.

In the first place it is wholesome, in these days of muck raking and excessively high finance, to find a railroad president who is willing to divide with his brother shareholders the benefit of operations which, though morally their own, conducted by their organization and financed from their treasury, might have been twisted to return a far greater profit to the individuals conducting the negotiations than has been the case.

The Value of the Ore Lands.

If Mr. Hill's estimate of a total tonnage of 500,000,000 tons in the ground on his lands is approximately correct, and subsequent and thorough exploration may, to be sure, prove it so, the ultimate value of this accumulation is more than $400,000,000. This is a prize that many men, even though wealthy already beyond the dreams of avarice, could not let pass through their hands without demanding an extortionate contribution.

As to the probable income from royalties appertaining to this new Lake Superior Company so many diverse figures are current in the more speculative channels of information that one estimate based less on speculation than on a knowledge of the situation in the ore district may be excused. The chief income producer for these certificates will be the royalties paid by the United States Steel Corporation. It may be physically possible for the corporation to mine from lands under the Hill agreement the 1907 minimum of 750,000 tons, but it is probably not economically possible. The policy of the Oliver Iron Mining Company, which carries on mine operations for the Steel Corporation, is not to push properties in such a way as to make ultimate costs excessive, but so to prepare for a long continued period of cheap mining that an entire ore body may be extracted at minimum expense. To this end the company has been shaping its operations more and more toward the stripping and open pit mining of all large deposits, and many projects of this nature are now under consideration, in addition to several of vast size that are actually in progress.

The Mines Included in the Transfer.

There is but one opened mine included in the transfer of the Great Northern lands to the Steel Corporation. This is Leonard, in section 28-58-20. Leonard's ore body is so deep and the milling pit exposing it so constricted that it will be almost an impossibility, even with the vast facilities of the Oliver Company, for any tonnage approximating 750,000 tons to be taken therefrom next year, in any manner consistent with the future of the property, and the Oliver Company's big, broad, and far-sighted methods. The same argument of good mining that will restrict Leonard's product will forbid any product from other of the Great Northern lands next year.

One of the very important tracts taken over by the Steel Corporation in this deal lies just east of Monroe mine, in section 27-58-20. It may be three years before this can be developed sufficiently to become a large and economical producer, for it must be stripped, and the surface is very deep and covers a large area. Perhaps the greatest aggregate of ore tonnage included in the deal under discussion is section 16-56-23, a square mile that is generally supposed to be largely ore. But this must be stripped and washing plants must be installed, while the surface is deep. It is doubtful if the Steel Corporation can reach even its minimum in these Great Northern contracts for some years. In that case its annual payments to Lake Superior certificate holders can be determined better with some degree of accuracy. They will not reach above that proportion of the Great Northern minimums, which actual Great Northern ore holdings bear to the leases under its name. Further, instead of being 85 cents a ton in each case, they will be that only in the case of lands held in fee by the Great Northern. It is doubtless well understood that a portion of the ores to which the Great Northern held title were owned in fee by others, to whom the Great Northern is obligated at an average price, say, of 25 to 30 cents a ton. The gross agreed minimums on the "Hill lands" so-called, will be $637,500 for 1907, and for 1908 they will be $1,300,000.

In the latter class of properties—that is, lands on which the Great Northern has obligations reaching back to fee title interests beyond its own title—is Leonard, from which the 1907 product must largely be secured.

Leases of Prior Years Turned In.

But the Great Northern turned into the new Lake Superior Company not alone the lands leased to the United States Steel Corporation but its accumulation of leases from prior years. On these lands four mines are and have been in operation. The Mahoning and Stevenson in T 75-21 are chief among these. Mahoning is a producer of about 1,000,000 tons per annum, and its royalty on this production is 15 cents a ton, or $150,000. This belongs in fee to the Great Northern Railway. It is not expected that its 1907 output will vary materially from that figure. Stevenson produced in 1906 about 1,000,000 tons, and with new ore discoveries of the year and additional stripping that has recently been completed may do as well one more season. This will give another $150,000 in gross royalties. The Kinney mine, of the Republic Iron & Steel Company, is the third property of this list. It has been running along for some years at under 100,000 tons per annum, but the management proposes to quadruple this in 1907, which means an income from that source of $72,000, its royalty rate being 18 cents a ton. The above sums represent what may be expected next year, with an increase for the following year of somewhat less than the increased minimum from the Steel Corporation, as Stevenson is probably not to be depended on for 1,000,000 tons a year beyond 1907.

Other Interests Receiving Shares of the Royalties.

Among other interests sharing with the Great Northern and receiving their portions of ore royalties are the Northern Pacific Railroad, Pillsbury, Bennett & Longyear and others. These hold an important share of the tonnage turned over. The Northern Pacific has a large and high grade ore body north of Leetonia, in 57-21, stripable, and already partially exposed. It owns ores near Hibbing and several properties on the east Mesaba. The Pillsbury, Bennett & Longyear and Hill, Bennett & Longyear lands contain a large tonnage and much good ore. On these the Great Northern is lessee and pays royalty.

Advanced royalty payments under this deal do not mean that the sums thus expended by the Steel Corporation are lost, either in payments to Great Northern or Pillsbury, Bennett & Longyear; they apply on ore which may be mined subsequently, and are thus an anticipatory payment merely.

Doubtless the policy of the Steel Corporation will be to mine as much above its Great Northern minimums as it may with economy, on account of interest charges on the royalties, and it will be advisable to take out ore deposits on which interest accrues and permit others to remain quiescent, or as nearly so as minimums permit. This will lead toward a very rapid increase in the amount of ore taken from Great Northern lands as quickly as the Oliver Iron Mining Company shall have equipped mines on those lands for the vast production expected.

Announcement is made by the Upson Nut Company, Cleveland, that on August 1, 1907, it will begin to operate its River Furnace at Cleveland, Ohio, which for a number of years it has leased to the River Furnace & Dock Company, an identified interest of Corrigan, McKinney & Co., Cleveland. The Upson Nut Company is now offering foundry and malleable pig iron for delivery in the second half of 1907.

Producer Gas Power Test.*

Data Obtained at the Plant of the Gould Coupler Company, Depew, N. Y.

BY J. R. BIBBINS, PITTSBURGH, PA.

Gas producers, especially for bituminous fuels, are quite familiar in metallurgical work, notably in the various iron and steel industries. Although the problem of gas purification presented in power work is somewhat more serious, experience has indicated several fairly simple methods of solution. The ability of the modern gas engine to take the place of the steam engine in general power work has likewise been questioned, as well as the capacity of gas engine and producer to work together harmoniously under widely varying load demands.

Fortunately neither of these charges is founded on a basis of actual conclusive experience, and it is the purpose of this paper to present some practical data upon the operation of a thoroughly representative commercial gas power plant; one in which a high measure of success has been obtained through intelligent engineering and supervision. Even though some minor improvements might still be suggested, the fact remains that this gas power plant is operating week in and week out, 24 hr. per day, 6½ days per week, on a fluctuating manufacturing load, with a fuel consumption fully one-half that of a modern steam plant of like character and suited to the same work. On an average of half load this 450 kw. plant ordinarily consumes from 2 to 2¼ lb. of coal per kilowatt-hour, and on heavier loads has reached as low a consumption as ½ lb. per kilowatt-hour in regular daily running. During heavy loads the plant has repeatedly developed without the battery 530 kw. on maximum fluctuations, which represents an overload of 18 per cent. rating. Furthermore, with the exception of the engineers in charge during the two watches, the plant is operated by attendants originally quite unskilled in gas work. Up to the present writing, however, no complete interruption of service traceable to defective equipment has been recorded.

Service and Details of Plant.

These facts are thought to be sufficiently impressive to warrant their presentation to the society, particularly as this plant may be regarded as exemplifying modern engineering practice and the service resulting therefrom. The plant in question serves the entire Gould manufacturing properties at Depew, a suburb of Buffalo, N. Y. Two complete works are located here: One devoted to the manufacture of storage batteries and the other to the manufacture of railroad specialties, principally automatic couplers. The latter contains a large and well equipped steel foundry. Both are electrically driven and lighted throughout from the central gas power plant. Contributing to the station load are a large number of labor saving machines of different types, such as electric traveling cranes, charging tables, transfer locomotives, elevators, conveyors, fans, pumps and machine shop tools. The storage battery works also use considerable current at times for "forming" battery plates.

Table I.—Equipment Data, 450 Kw. Producer Gas Engine Power Plant.

Service—Power, some lighting.
Number of units—Three, 150 kw.
Distribution system—D. C. two wire.
Pressure—250 volts, normal 230.
Power building—45 x 61 ft. inside.
Hight of roof trusses—28½ ft.
Hight of basement—9 ft.
Total area per kilowatt—6.1 sq. ft.
Net area of unit—15 x 33½ ft.
(With 6-ft. passageways.)
Net area unit per kilowatt —2.87 sq. ft.
Walls—Red brick, exterior pilasters, limestone trimmings, steel framework.
Roof—Wood, tar and gravel, steel trusses, monitor.
Floors—Steel, wood, ¾-in. maple finish.
Basement floor—Concrete.
Foundation—Concrete.
Crane—Hand power.
Producer building—Steel framework.
Corrugated iron walls and roof.
Charging floor—Boiler plate.
Cooling pond—1,000,000 gals.
Dimensions—280 ft. diam. x 93 ft. wide.

	Sq. ft.
Area (power plant)	7,300
Area (producer plant)	7,500
Total	14,800

Depth—Normal 10 ft.
Holder—36 in. diam., single lift, 15,000 cu. ft.
Coal used—Bituminous run of mine.
Sources—Buffalo, Rochester & Pittsburgh Railroad.
Price—$2.30 per ton.
Heat value—13,500 B.t.u.
Engines—Westinghouse three-cylinder, vertical gas engines, single acting four-cycle.
Capacity—235 b.h.p., 260 maximum.
Normal speed—200 rev. per min.
Size cylinders—(3) 19 x 22 in. stroke.
Ignition—110 volts and 8 volts, 2 sets four cells storage battery.
1 motor generator set, ½ kw.
Cooling water (jackets)—Motor driven centrifugal pumps.
Two 2-in. Worthington "volute." 15-hp. motor, 1450 rev. per min.
Cooling water (scrubber)—Two-stage motor driven. 2-in. Worthington "turbine" type. 15-hp. motor.
Compressed air—100 lb. from works, also 6 x 6 in. Rand duplex single stage compressor. 10-hp. motor.
Generators—Westinghouse compound wound, D. C.
Capacity—150 kw., 250 volts.
Switchboard—250 volt D. C.
Producers—Loomis-Pettibone.
Type—Bituminous, duplex intermittent blast. 3 ft. to 8 ft. diam.
Boiler—5 ft. diam. vertical tubular, utilizing waste heat.
Wet scrubber—6 ft. diam., vertical, coke, water sprays.
Dry scrubbers—Two 9½ ft. diam., in parallel; excelsior, two layers.
Valves—Gear lift, water cooled.
Exhauster, Root's—Simple engine drive.
Gas main—12 in. diam.
Gas risers to engine—8 in.
Fittings—Screwed.
Valves—Chapman gate.
Coal handling—Bucket elevator, motor driven.

Fluctuations in Load.

Although the power station load is smoothed out to some extent by the overlapping of demands from these various sources, yet the larger machines pull heavily upon the system, with the result that the load at the station busbar is subject to violent fluctuations, easily 80 per cent. above or below (on light loads 100 per cent.) the general averages. As no system of notification is in force the power station cannot be apprised of anticipated demands from the several production departments of the works. The storage battery forming load is, of course, steady while it exists, but it is liable to be abruptly thrown on or off at any time.

Several typical runs are shown in the accompanying logs, Figs. 1a, 1b, 1c, 1d, for April 13, July 11-13 and September 25, 1905, respectively. Although the recorded

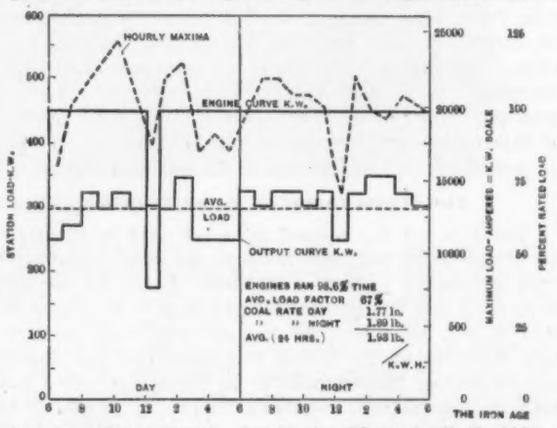


Fig. 1a.—Load Diagram, Gas Engine Plant, April 13, 1905.

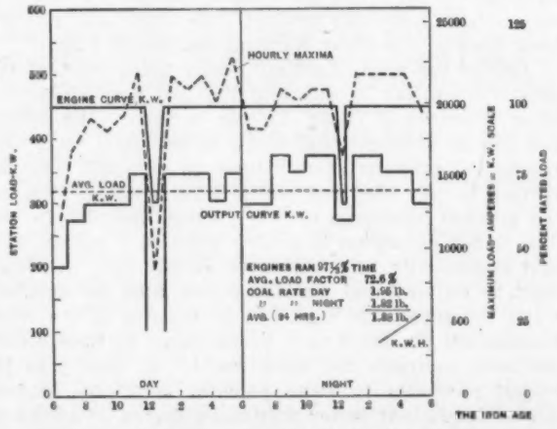


Fig. 1b.—Load Diagram, Gas Engine Plant, July 11, 1905.

* A paper read at the New York meeting of the American Society of Mechanical Engineers, December 5, 1906. Portions of the paper have been somewhat condensed.

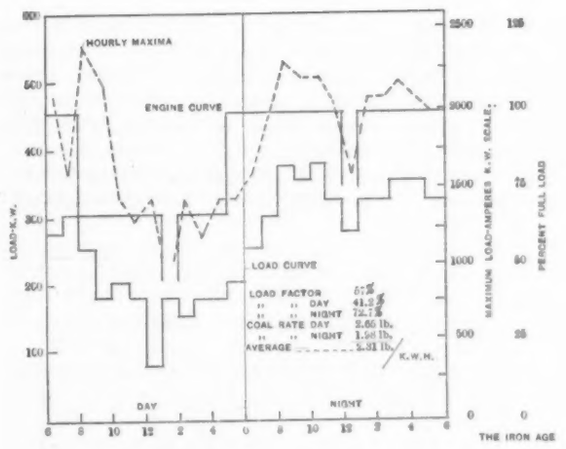


Fig. 1c.—Load Diagram, 450-Kw. Gas Power Plant, July 13, 1905.

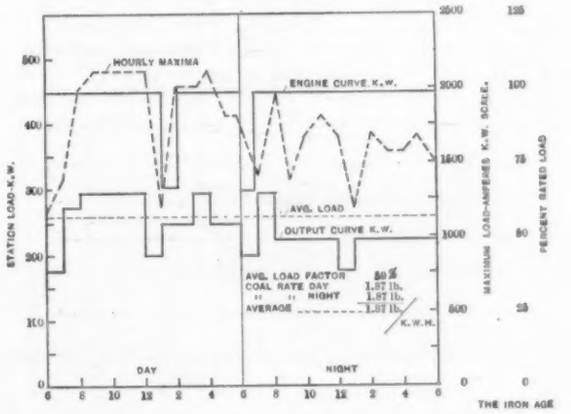


Fig. 1d.—Load Diagram, Gas Power Plant, September 25, 1905.

output is fairly steady through the day, the fluctuations correspond in some cases to overloads of 15-20 per cent. on the engines. The original plant was entirely capable of handling these fluctuations, but on account of doubling the steel plant load and adding electrically driven air compressors, an auxiliary storage battery was recently installed for the dual purpose of securing a more constant load on the engines with higher economy of fuel, and of increasing the average load. Formerly it was necessary to keep the spare unit constantly in service to tide over the peaks. This storage battery, however, was not placed immediately in service and does not affect the results presented in this paper except in the matter of capital costs.

Plant Duty.

From the daily records of the plant an excellent idea of its operative efficiency may be obtained. These records, although not elaborate, are carefully kept and show not only the output and duty of the plant but also the maximum loads that occur during the hour. A digest of a typical day's run is given in Table 2 and shows continuous operation except at noon and midnight; to be exact, 97 per cent. of the elapsed time. The load averaged 263 kw., or 58 per cent. of the generating capacity in service with nine full load hourly maxima and five equivalent to 8 per cent. overload. The average coal consumption for all purposes was 1.89 lb. per kw.h. generated.

During a 10-day run in September, 1905, the results shown in Table 3 were recorded. The engines averaged 87¼ per cent. of the possible running time and on 54 per cent. station loading factor the plant consumed 2.04 lb. fuel per kw.h., or 1.44 lb. per b.h.p.hr. The loading factor = average 24 hr. station load ÷ rated capacity. The true load factor = average 24 hr. load ÷ maximum. With coal of 13,500 B.t.u. calorific value the efficiency of this plant averages about 13.1 per cent., thus rivaling, if not excelling, the largest modern steam power stations. On September 27, the fuel rate was 1.88 lb. per kw.h. (or about 1¼ lb. per b.h.p. hour) with 62 per cent. loading factor, corresponding to a plant efficiency of over 15 per cent.

The author has been deeply interested in the effect of

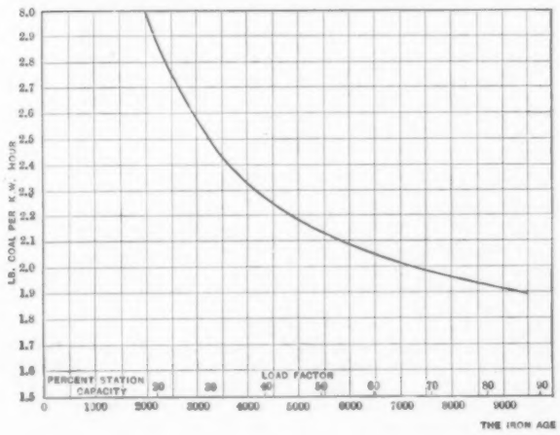


Fig. 2.—Relation of Fuel Rate to Station Loading Factor.—Plotted from Observed Data.

the loading factor of a plant upon its efficiency and commercial duty. An unusually good opportunity arose in analyzing the results of this plant and the approximate

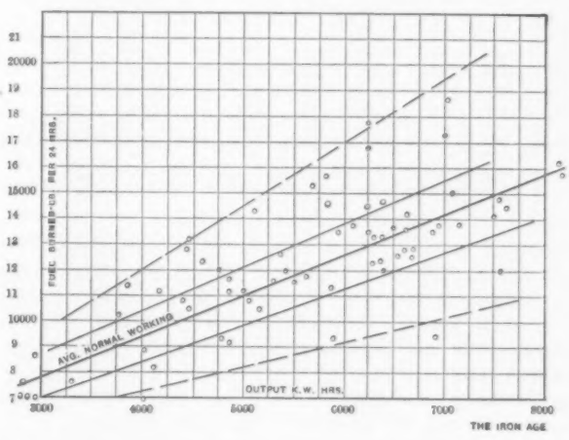


Fig. 3.—Fuel Consumption at Various Outputs.—Graphical Method of Obtaining True Average.

relation is presented in Fig. 2. In order to obtain a closer average, the "shotgun" method (Fig. 3) was used, plotting total fuel per day to output. Barring some unusual results occurring in the early days of the plant, the average fuel consumption is approximately a straight line within observed limits. From this the average fuel per kw.h. may be obtained, Fig. 4, and the relation approximates a rectangular hyperbola within normal ranges of load. The upper convex curve, Fig. 4, expresses the kinetic or absolute efficiency of the station. Kinetic efficiency is defined as = thermal equivalent of work done ÷ heat in coal. It is interesting to observe that this small plant normally operates with an efficiency between 12 and 13 per cent. average. Since the observations above referred to were made the plant has been giving much better efficiency, the coal consumption averaging 1.8 per kw.h. with an 85 per cent. loading factor. This corresponds to the plant efficiency of over 15.4 per cent. at the engine shaft, or 14 per cent. at the switchboard. Several runs averaging 1.55 lb. per kw. are recorded, equivalent to a plant efficiency of 17.7 per cent. at the shaft, of 16.3 per cent at the switchboard.

Table II.—Typical Log.

Gas Power House Daily Statement for September 26, 1905.

Time.		Producers in 1 2 3	Engines in 1 2 3	Pumps in 1 2 3	Station Watt-Meters. Output K W	Volts.	Max. amperes.	Remarks.
A. M.	7	△ △	△ △ △	△ △ △	1,453,800	230	1000	
	8				,300	230	2100	8¾ overload.
	9				,300	230	2100	
	10				,200	230	2000	
	11				,300	230	2100	
	12		▽ ▽		,300	230	2100	
P. M.	1		△ △		,100	230	2000	
	2				,300	230	2100	
	3				,200	230	2000	
	4				,300	230	2000	
	5				,300	230	2000	Full load about 1950 amperes.
	6				,200	230	1800	
	7				,250	230	1700	
	8				,300	230	1900	
	9				,300	230	1900	
	10				,300	230	1800	
	11				,300	230	1900	
	12		▽		,300	230	1900	
A. M.	1		△		,150	230	1100	
	2				,300	230	1900	
	3				,350	230	1800	
	4				,300	230	1800	
	5				,300	230	1900	
	6	▽ ▽	▽ ▽ ▽	▽ ▽ ▽	,250	230	1700	

Meter Readings.

6 p.m.	1,462,600
Previous	1,459,700
Output	2,900
Coal, 6,000; coke, ——.	
Rate, 2.06 lb. per kw.hr.	
6 a.m.	1,466,000
Previous	1,462,600
Output	3,400
Coal, 6,300; coke, ——.	
Rate, 1.85 lb. per kw.hr.	

Table III.—Operating Data.

Date. Sept. 1905.	Engine hours' run.	Per ct. full day run.	Output, kw. hr.	Load—Kw. Aver.	Load—Kw. Rated.	Station loading factor.*	Fuel used.	Coal per kw. hr.	Coal per b.h.p. hr.
20	71	98⅜	4,850	202	450	45	11,100	2.29	...
21	65½	91	5.275	220	450	49	11,400	2.16	...
22	70	97¼	6,550	273	450	61	12,700	1.93	...
23	45¾	63½	4,025	188	450	41.7	8,800	2.18	...
24 Sun.	24	33⅓	2,250	187.5	450	41.6	†6,600	†2.93	...
25	70½	98	6,400	267	450	59	12,000	1.87	...
26	69¾	97	6,300	263	450	58	12,300	1.95	...
27	70½	98	6,700	279	450	62	12,600	1.88	...
28	72	100	6,700	279	450	62	12,900	1.92	...
29	70½	98	6,600	275	450	61	12,900	1.95	...
Aver.	63	87¼	5,565	243.4	450	54	11,330	2.04	1.44

* Loading factor = % continuous generating capacity.
† Includes extra coke used on Sunday for starting new fires.

Efficiency of the Producer.

From the above data and the measured efficiency of the gas engine, the efficiency of the producer plant may be roughly estimated. Assuming 50 per cent. loading factor, the average plant efficiency is 12 per cent. As the efficiency of the engines is approximately 17 per cent. at this load (see Fig. 6), the producer plant operates at an efficiency of slightly above 70 per cent. With higher loading factor, 75 per cent., the plant efficiency is 13 per cent. average, engines 20 per cent. and producers 65 per cent. During an especially good day's run, as on

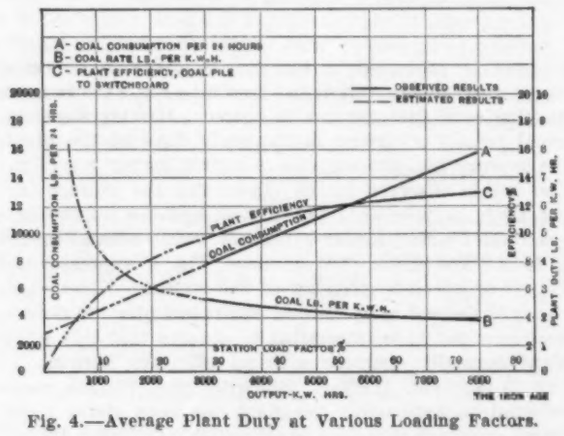


Fig. 4.—Average Plant Duty at Various Loading Factors.

September 27, the efficiencies were as follows: plant 15 per cent., engines 21 per cent., producers 71.5 per cent. These results indicate that the producer plant is, from an everyday operative standpoint, fully as efficient as a high grade boiler plant and frequently more so. It is certainly not more difficult to handle.

Cost of Power.

As to the cost of power the following analysis reveals a total cost of well under 1 per cent kw.h., including fixed as well as operating charges. At normal prices, coal costs $2.30 per ton. Assuming an average daily output of 5000 to 10,000 kw.h., representing the probable minimum and maximum for full working days, and adding the fixed or capital charges amounting to about 9 per cent. on $91,650 (or $81,000 excluding the battery),

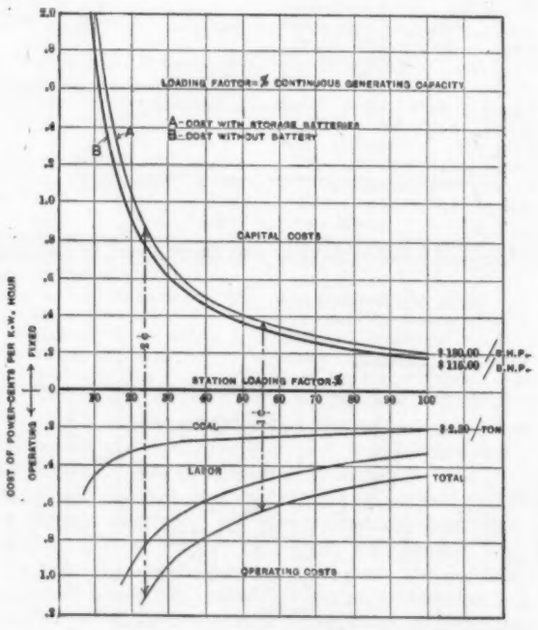


Fig. 5.—Relative Power Costs at Various Loading Factors.

the distribution of cost items is substantially that given below:

Approximate Power Costs.

	Minimum.	Normal.	Maximum.
Output—Kw.hr. per day	5,000	8,000	10,000
Fuel—Cents per kw.hr.	0.25	0.22	0.20
Labor—Cents per kw.hr.	0.28	0.17	0.14
Supplies and repairs (estimated), —Cents per kw.hr.	0.17	0.13	0.11
Operating costs—Cents per kw.hr.	0.70	0.52	0.45
Fixed charges	0.45	0.28	0.22
Total costs—Cents per kw.hr.	1.15	0.80	0.67

The charges for supplies and repairs in the above are estimated, owing to absence of more accurate data and the comparatively short time plant has been in operation. Assume 25 per cent. of total power costs at 50 per cent. L. F., hence the estimate is conservative. It should be noted that were the plant to operate regularly at the lower load factors less labor and supplies would be required and the light load costs would be correspondingly reduced. The curves, Fig. 5, are based on full plant in service operating continuously.

In order to emphasize the effect of the loading factor, Fig. 5 has been prepared showing the relation of both capital and operating costs to the station loading factor, the former plotted above and the latter below the X axis. Total cost of power is given by the total ordinate. Observe the rapid change in costs on light loading, especially of fixed charges. Coal, on the other hand, remains fairly constant; labor, a constant charge, increases rapidly on light loads, and supplies and repairs, a veritable charge, less rapidly. The importance of loading factor is well brought out by this diagram; *e. g.*, the total cost of power is halved by increasing the loading factor from 24 to 55 per cent.. An industrial or railway power plant usually operates on about the latter figure, a moderate sized lighting plant on the former; hence, the danger of indiscriminate comparisons of operating costs in power plant work. Considering that the results above enumerated have been obtained from a comparatively small plant, operating under conditions by no means conducive to the attainment of the highest economies, the Depew plant offers a striking object lesson that should not fail of appreciation among engineers confronted with similar problems.

Generating Plant.

Considerations of operating economy largely influenced the choice of gas engines for this plant where steam coal costs from $2.25 to $2.40 per ton, and gas coal about the same. At this price it was estimated that, although the difference between the steam and gas was small on half-day working, for a 24-hr. day the latter's advantage was decisive. The installation of three units of similar size and identical construction wisely avoided the duplication of parts which two or three sizes of engines would have occasioned. By the use of direct connected units a very compact power house arrangement has resulted, the total floor area per kw. being 6.1 sq. ft., and the net area of each unit with 6-ft. passageways 2.9 sq. ft. per kw.

The efficiency of these engines as heat engines is well indicated by the appended results of tests shown in the accompanying Table 4 and diagram, Fig. 6, made at the builder's works on natural gas which was at that time the only fuel available for testing purposes. As engines for producer gas are usually constructed for somewhat higher compression than those operating on illuminating or natural gas, their efficiency would presumably be slightly better on natural than on producer gas fuel; yet for commercial work a difference of 15 lb. in compression would scarcely be appreciable. In Fig 6 the upper concave curve represents the gas consumption per b. hp. under different loads and the convex curve, the kinetic or absolute efficiency.

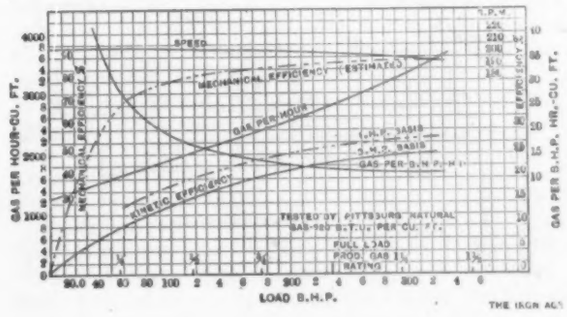


Fig. 6.—Average Efficiency Tests of Three 19 x 22 In. Single Acting Gas Engines, Four-Cycle Type, Vertical.

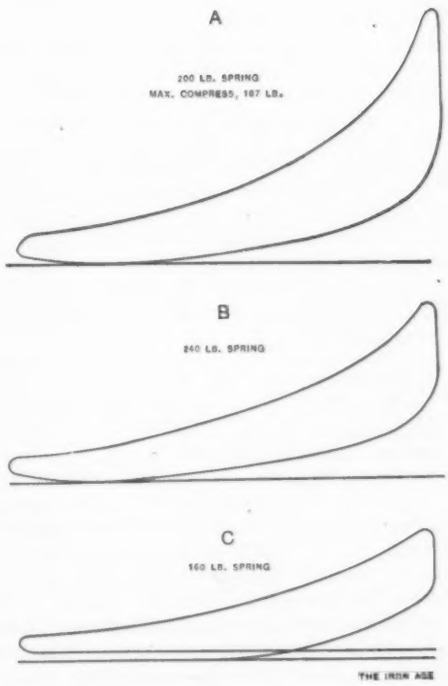
Table IV. Average of Engine Efficiency Tests.

Load.	Over.	Full.	Half.	Remarks.
Brake horsepower...	325.3	239	121.3	By Prony brake
Speed rev. per min..	198	203	206.3	By counter.
Gas per hour.....	3,547	2,840	1,985	Corrected to 62° F., 30" Hg.
Gas per b.h.p.hr....	10.9	11.87	16.36	Corrected gas—no load—1,250 ft. per hour.
Heat value gas*....	920	920	920	Effective B.t.u. per cu. ft.
B.t.u. per b.h.p.hr.	10,030	10,910	15,050	
Brake kinetic efficiency	25.37	23.32	16.9	B.hp. basis.
Mechanical efficiency..	89	87.5	82.5	Estimated.
Indicated kinetic efficiency	28.5	26.7	20.5	I.hp. basis.
Speed variation-max.	4.2%			No load speed, 206.6.
Speed variation, no-full load.....		1.8%		Average speed.
Speed variation, no-half load.....			0.7%	
Per cent. full rating	138.4%	101.6%	51.6%	On producer gas.

* Pittsburgh natural gas—Junker calorimeter.
Engines rated 235 b.h.p. on 130 B.t.u. producer gas.

The ability to convert into useful power over 25 per cent. of the effective heat in the gas gives evidence of high efficiency.

These engines operate on the four stroke cycle involving constant quality of mixture and throttling governing. The actual proportioning of gas and air is accomplished by two plug valves at the bottom and the top of the mixing chamber, respectively, each with graduated index. These valves may be set by hand at any time to accommodate varying qualities of gas. An automatic diaphragm pressure regulator reduces the pressure of the incoming gas to atmosphere at the engine.



Figs. 7a, 7b and 7c.—Typical Indicator Cards, Corresponding to Loads in Table IV.

Engine Auxiliaries.

A most important factor in the successful operation of the engines is the ignition apparatus. For increased security each igniter plug has two sets of points, each set independently connected. Should one set of points, through any cause, become unfit for use, a small double throw switch may be reversed, thus turning the ignition current through the other points. In addition, three independent sources of current have been provided, all of the apparatus being contained in a central ignition cabinet. For starting, one of two 8-volt storage batteries is used. For running, a small ½ kw. motor generator unit is used delivering 110 volt current to the igniters through incandescent lamps, which furnish a valuable "tell-tale" for "open circuits," "grounded igniters," or "hanging fire" of igniters. These two sets of storage batteries are charged alternately through a bank of lamps from the motor generator or from the main station bus bar, one or the other set being always available in an emergency. By means of small double pole switches at the igniter cabinets, throwing over from the low to the high tension system may be instantly accomplished without in the least disturbing the engines. The ignition problem has thus been handled with great care in the provision of six individual combinations of current supply.

Starting of the engines is accomplished as usual by compressed air drawn from a pipe connection to a compressed air line in the works or from the relay compressor. Although only 90 to 100 lb. pressure is ordinarily carried, yet the engines may readily be brought up, cold, to full running speed, within 30 to 40 secs. With higher air pressure available, starting may be accomplished in even less time, as the mixture ignites more readily when quickly compressed, owing to the smaller opportunity for the dissipation of internal heat.

Cooling Equipment.

Another important part of the plant equipment is the circulating water system for cooling jackets, combustion chambers and exhaust valves. Motor-driven rotary pumps are ideally suited to this work on account of the moderate pressure required—about 25 lb. per sq. in. Two of these pumps (one for relay) serve the engine plant, while a third, of the two-stage turbine type, serves the gas producer scrubber in which a higher pressure is desirable. Although each pump is driven by a 15 h.p. motor, the power ordinarily required is considerably less than this, especially in moderate and cold weather when

the quantity of water supplied to the engines may be largely reduced by throttling the pump outlets.

Cooling water for the engine is drawn from near the bottom of the cooling reservoir through a screen house, while the hot jacket water is returned to the surface of the pond, about 150 ft. distant. During the progress of the water from inlet to outlet enough heat is dissipated to the earth and atmosphere to reduce the outlet water to the proper temperature. During periods of extreme heat and humidity when the cooling process is retarded, a larger quantity of water may be sent through the jackets to compensate for the lesser difference in temperature. For this the rotary pumps are well suited. In September, 1905, the following observations were made:

	Degrees F.
Jacket water entering pond	99.3
Surface of water near inlet	78.8
Air	73.8
Bottom of reservoir near outlet	76.1
Surface of reservoir near outlet	77.9
Average load on plant	310 kw. = 500 hp.

Thus on a fair day with practically seven-tenths load on the plant there was a difference in temperature of 1.8 degree F. in eight feet depth of water, 0.9 degree F. difference between the temperature of reservoir at intake and outlet, 4.6 degrees F. difference between air and mean reservoir temperature and 23.2 degrees F. total cooling. Apparently considerable cooling took place through the transmission of heat through the bottom of the reservoir.

Piping.

Some trouble has been experienced with the gas gates, due apparently to cumulative deposits of carbon, and frequently it becomes impossible to seat the valves tight. In work of this class it would seem that a parallel seated, quick closing gate would be best suited, being self-cleaning, and the gas could be cut off almost instantly in case of emergency.

The engine exhausts all discharge into a cast iron header running beneath the floor to a concrete exhaust well outside, serving as a muffler. Unfortunately, it is impossible to cool these exhausts by water sprays on account of the large amount of SO_2 in the gas. If water were used, as is the practice with natural gas, the piping would soon be destroyed by corrosion. As some 30 per cent. of the total heat value of the gas is lost in the exhaust, radiation is a somewhat disagreeable feature, especially in warm weather. This trouble may, however, be obviated by enclosing the piping in a concentric sheet metal casing through which rapid circulation may be maintained from besement to ventilators in the roof. It is also possible that a reinforced concrete duct might be employed for exhaust piping, molded in sections, cemented in position and encased in sheet steel. If rigidly supported this material should easily withstand both the heat and corrosive action of the exhaust vapors when water cooled in the usual manner.

The muffler well is, to be sure, a common arrangement in gas power plants, but most certainly could be improved upon. First, the noxious products of combustion rising from the pit, although located in the open, are driven directly into the engine room during certain prevailing winds to the great discomfort of the operators. Second, if the exhaust pit is carried to any considerable distance from the power house, a serious back pressure is imposed on the engines owing to the friction of the high pressure exhausts on the internal surface of the main. Usually the well is located close to the building with a short standpipe. This outlet is almost invariably too small, resulting again in serious back pressure from throttling. And it usually occurs that sooner or later the structure is dismantled by sudden pressures due to delayed combustion or other causes. A more logical arrangement would seem to be as follows: (1) A brick or concrete exhaust well of large dimensions built next to the power house foundation wall and loosely filled with large broken rock, (2) a brick stack extending to the roof and built into the building structure integral with pilasters, thus taking advantage of the reinforcement offered by the steel skeleton of the building, (3) simple sheet steel flap doors or louvres inserted in the roof of the exhaust pit and at two or three points in the chimney to relieve occasional local pressures. In this manner the noxious gases are easily taken care of by a flue of cheap construction, agreeable appearance, and ample capacity for any contingency.

Cooling Water Piping.

The piping for cooling water is simple, a manifold supplying all three cylinder jackets in parallel. Water enters at the bottom of the jacket, emerging from the top. A small pipe loop at the discharge end of the upper manifold with vent cock at the top to break the vacuum serves to prevent the syphoning effect which under certain conditions might pull all the water out of the jackets, leaving nothing but steam. This vent is useful as a tell-tale showing stoppage of jacket water supply.

In cooling the exhaust valves a fairly constant supply is desirable, irrespective of the load. The arrangement shown in Fig. 8 is therefore employed, by which the jacket water may be throttled as much as desirable, while constant head is maintained at the exhaust valves.

Operation of Engines.

Four men, two to a shift, operate the generating plant, the oilers and the two engineers, being formerly steam engine operators. The personal attitude of the chief engineer toward the gas engine plant well refutes the frequent argument that gas engines require more

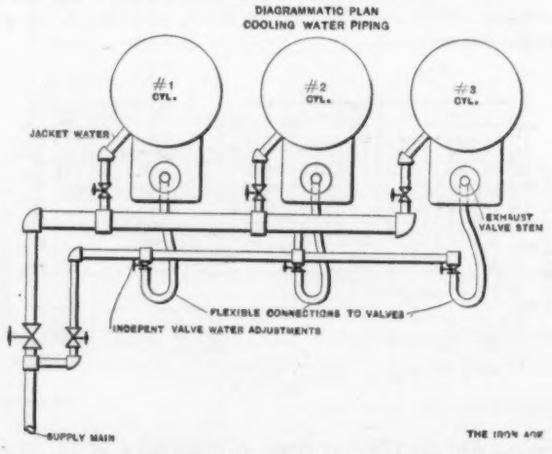


Fig. 8.—Plan of Cooling Water Piping for Cylinders and Exhaust Valves.

skilled operators than steam engines. The plant not only requires less actual manual labor to keep in running order, but it is fully as responsive to good handling as a steam plant. All things considered, he "would regret to go back to steam." The fact that the engines are often left in charge of, and operated by, the oilers illustrates the point in view.

While the producer is undergoing renovation on Sundays, the engines are also inspected in rotation, mixing valves flushed down with gasolene to remove lampblack deposits (likewise cylinders, now and then to keep the packing rings free), valves are ground in and igniters replaced when necessary, jacket deposits cleaned out when obstructed to any extent, and the engines generally adjusted. Reducing valves are also cleaned at intervals from carbon deposits. Practically the only trouble experienced thus far has been the occasional cutting of an exhaust valve, presumably due to cumulative carbon deposits on the valve seats. The lampblack has also occasioned some difficulty in lubricating valve stems. Igniters, of course, wear down gradually, but extras are always kept on hand and repointed as fast as necessary. Usually one igniter will last from six to nine months without repointing. Since commencing normal operation engine repairs have been confined to these two items and are comparatively light considering the conditions of operation. Very little trouble has been experienced with lubrication, as the main working parts are automatically supplied by the splashing of oil. All oil used in outer bearings returns to the crank case to make up that lost through evaporation. When the oil reaches too high a level the excess is drawn off, filtered and used over in the bearings.

In starting and stopping the engines the attendants

have acquired so much skill that the barring lever is seldom used. By manipulating the air valves just as the engine comes to rest it is not difficult to bring the air cams in starting position so that no time need be lost in barring the engine around to the position for starting.

Tar Eliminated in the Producer.

A notable feature of the producer plant is that it is capable of gasifying bituminous coals without making quantities of tar. The process is intermittent, embodying the now more or less well known system of passing the green hydrocarbon distillates through a secondary fire bed which has previously been brought up to the proper temperature by blasting with air. Since the plant was started, a fair grade of soft coal (B. R. & P. run of mine) has been used, averaging about 13,500 B.t.u. per pound. Although this coal presumably contains 35 per cent. of volatile, tar destruction in the producers is complete, but at the same time a considerable quantity of lampblack has resulted which has made it necessary to devise special means to handle this by-product. No attempt has been made to market it, as some is used in the preparation of paints for castings, &c.

Straight producer gas is not made directly, but water gas and air gas are made at alternate intervals of varying duration according to richness of the gas desired. In metallurgical plants the two gaseous products of the system are often handled separately, the water gas being used for heating furnaces on account of its high flame temperature and the blast gas in gas engines for power purposes. And it is an interesting fact that, although this blast gas would be absolutely unfit for any other use on account of its comparatively low calorific value—from 80 to 90 B.t.u. per cu. ft.—yet it is quite suitable for gas engine work, in that it is not at all snappy (as is water gas) and, therefore, permits of higher compression. At Depew the two gases are mixed in a single holder in the proportion generated.

In this system two producers constitute a unit. Usually it is desirable to have a separate unit on hand for relay purposes. Here this was especially necessary in order to provide an opportunity for freeing the producer from clinker formed during the week's run. At Depew a novel arrangement was first employed, in the form of a clover leaf with three producers united at top and bottom by T pipe connection with the necessary water cooled valves. It was then possible to renew one producer fire per week in rotation, and at the same time save the cost of a fourth producer to complete the duplicate unit. Through no fault of this arrangement, however, it was not an entire success, owing to the difficulty in preventing the leakage of water gas into the idle producer through the valves. This difficulty has now been overcome and a complete relay plant, including scrubbing equipment, is provided in the adjoining producer building with sensibly better results than before.

Producer Auxiliaries.

A feature of the system is that all steam required is generated entirely from the sensible heat of the gases coming from the producers which would otherwise be wasted in cooling water. This condition, however, obtains only when the plant is heavily loaded. Running light it would be difficult to make sufficient steam to operate the producer auxiliaries. An air auxiliary boiler would have to be drawn upon. With the high "heats" necessary in the intermittent process, this represents an important saving. The boiler, however, requires weekly cleaning.

The proper cleaning of the gas is a difficult problem, owing to the fact that lampblack does not easily adhere to a wetted surface as does ordinary cinder dust. In this plant the gas first passes upward through a wet scrubber containing several tiers of small coke constantly wetted down by water sprays. A thin layer of dry excelsior is also used in the top tiers. Emerging from the wet scrubber, the gas enters two large dry scrubbers filled with several tiers of excelsior and piped up in parallel so that the velocity of the gas is not only reduced but also the amount of gas handled by each drier. Finally, an engine driven Root's exhauster delivers the gas to the holder.

The various valve movements are handled mechanically by rack gears with operating wheels conveniently placed on the level of the operating floor.

Producer Operation.

The present method of operating the producer plant requires an air gas run of 10 to 15 minutes, according to the demand for gas at the power plant, and a water gas run from one-half to three-quarters of a minute, the resulting mixture being well suited to power work.

Frequent testing of the quality of the gas made is not now practiced on account of its uniformity under the present operating condition. The holder, of course, greatly assists in insuring uniform gas at the engines. At the same time it provides sufficient capacity for operating one unit at full load for about three-quarters of an hour; the full plant in inversely proportionate time. Storage capacity is particularly valuable when a new fire is being put into service. This is usually done during the noon hour when the load is light, so that a lowering of the heat value of the gas is relatively unimportant.

In ordinary operation it is a simple matter to observe the quality of gas by means of two sampling flames always in view of the operators. One consumes gas from the holder; the other consumes freshly made gases as they leave the dry scrubber. Any irregularities may then be readily detected. Calorimeter tests show the gas as made at the present time to average slightly above 100 B.t.u. per cu. ft. (see Table 5). This comparatively low heat value is, of course, due to the preponderating period of blasting. With the rate of water gas mixing practically fixed, the only variable factor to compensate for varying demands for gas is the rate of blasting; hence, there is a long and subdued air gas run with a rapid but short run on water gas. During the second test (Table 5) the gas consumption was observed to be about 1,100 cu. ft. per minute at a load of 395 kw. This is equivalent to 167 cu. ft. per kw.h. at seven-eighths load on the generating units, and represents approximately a duty of 16,700 B.t.u. per kw.h., or a little over 11,000 B.t.u. per b.h.p. hour.

Coal consumption is determined by direct weighing in the producer house. Each shift weighs up enough coal at the start to run the plant through twelve hours; should there be a surplus at the end, it is weighed back and charged to the next shift, thus making each shift responsible for all fuel used during their run.

The entire producer plant is operated throughout the week by four men, two to a shift, with some additional labor on Sundays for cleaning. All the attendants were unskilled foreigners before taking up the producer work. During a half day shut down of the plant on Sundays, all renovating of the producer equipment is done; boiler tubes are cleaned, wet scrubber washed down, the excelsior in the dry scrubbers taken out and shaken free from lampblack, gas mains flushed out and a new fire started in the idle producer. At the same time, another producer is taken out of service, fires are drawn, and during the week, after it has had an opportunity to cool off, the hard clinker, which adheres to the lining, is broken off. For the starting layer of a new firebed, coke is used to the extent of some 3,000 lb. per producer, a sufficient quantity to affect the coal consumption of the succeeding day. If allowed to form to any extent, clinker constitutes a frequent source of trouble in operating the plant, and it is important that the selection of coal be made with this in view. With fires fairly free from clinker the suction required for blasting may be only 8 to 10 in. of water, but with fires badly clinkered it may run up to 25 in. With 10 to 15 in. drop in the scrubbers, this imposes from 30 to 40 in. suction on the exhauster, thus largely increasing its steam consumption.

Table V.—Characteristics of Power Gas.—Typical Analysis.

Date, June, 1905				20th.	21st.	23d.
Number of hours test				3	10	10
Intervals of tests (minutes)				15	15	15
Minimum calorific value				98	91	91
Maximum calorific value				113	110	104
Average calorific value				105	100	100
Maximum variation from average				7½%	10%	9%
Date.	H.	CO.	CH_4	O.	CO_2	N.
September 9, 1905	9.50	21.0	1.9	0.6	6.5	60.9
September 12, 1905	10.13	22.8	2.2	0.4	5.6	58.9

Canada's Triple Tariff.

Analysis of the Tariff Put in Effect November 30.

TORONTO, December 1, 1906.—Mr. Fielding has contrived to impress upon his new tariff nearly all the characteristics by which tariffs are classified. Instead of being this or that kind of tariff, it is of all kinds. It can be praised or condemned, according to the point of view, as a tariff for revenue, as a tariff for freer trade, as a tariff for protection, as a tariff for preferential trade with Great Britain, as a tariff for reciprocity. The scheme has been most skilfully designed to humor every division of opinion on the subject of fiscal policy. Dissatisfaction there was bound to be from some quarter, no matter what form the revision should assume, and it may be that Mr. Fielding has provoked some in all quarters, but it must be said that such as has been heard from up to the present is of a mild character. Nobody seems to be very furious. Quite possibly the judgment or wrath of some interests is only suspended until the full meaning of the measure is grasped, for the details of the somewhat complex arrangement will not be mastered in a hasty reading of a newspaper report of it. At the present moment the tariff experts of the Canadian Manufacturers' Association are studying its schedules, and the Ministers will doubtless soon hear what the association thinks of it.

Drawn up in its three columns the new tariff looks quite formidable, but as a matter of fact there are not more lists of duties in force now than there were before the budget was presented. The three columns are under the following heads: "The British Preference," "The Intermediate," "The General." The intermediate tariff is not in effect, and will not be put in effect except as a concession of reciprocity to any given country or countries. There were a general tariff and a British preferential tariff before, but as the rates of the latter were uniformly two-thirds of those of the former there was no need to exhibit the duties on British goods in a separate list. Mr. Fielding decided to abandon this invariable ratio of the preferential duties to the general duties, as it appeared to him that on some goods the flat discount of 33 1-3 per cent. was unduly large. He therefore worked out an independent tariff for the benefit of the British, making the concessions more liberal where there was more advantage of foreign competitors of Britain to be overcome here, and making it less liberal where interests of home producers seemed to be entitled to more protection.

The General Tariff.

While rather numerous, the changes in the general tariff are so unimportant that it can hardly be supposed they would have been made if the plan of a single column of duties had been adhered to. They were determined apparently as adjustments to the other parts of the scheme—the new preferential table of duties and the intermediate table. Switches, frogs, crossings and intersections for railroads, for example, are rated 32½ per cent. under the new general tariff, as against 30 per cent. under the old one—the reason for the change presumably being that it was thought desirable to make the intermediate duty 30 per cent. and the preferential 20 per cent. Axes, scythes, straw knives, hoes, rakes and pronged forks were 25 per cent. under the old general tariff and are 22½ under the new, the preferential and intermediate rates being 15 and 20 per cent., respectively. Mowing machines, harvesters, self-binders and reapers, which were dutiable at 20 per cent. under the old general tariff, are reduced to 17½ per cent. under the new, the preferential and intermediate duties being 12½ and 17½, respectively. Threshing machine outfits, consisting of traction or portable engine and separator, were rated at 25 per cent. under the old general tariff and are 20 per cent. under the new, the preferential and intermediate rates being 15 and 17½ per cent. Shovels and spades, and blanks for the same, and lawn mowers, 35 per cent. under the old general tariff, are 32½ per cent. under the new, and 20 and 30 per cent., respectively, under the preferential and intermediate tariffs. Mold boards, plowshares, landsides, &c., when cut to shape but not otherwise manufactured, are now free, whencesoever they come, though formerly the general duty on them was 5 per cent. Most of the examples above adduced are from the list of articles used by farmers, and illustrate changes on the side of reduction of duty. Unquestionably it was the desire of the Government to obtain credit for lowering the duties on articles used by that class of producers, even though the relief conceded might not be very great. On the other hand, as is shown below, galvanized wire for fencing, which was free before, is now subject to a duty of 5 per cent., except when imported from Great Britain. Barbed wire, also formerly free, appears now to be comprehended in item No. 406 as "Wire of all metals and kinds not otherwise provided for," and made dutiable at rates of 20, 10 and 12½ per cent., according as it is imported under the general, the preferential or the intermediate tariff. It is interesting to note, in connection with these changes affecting wire, that wire rods are still on the free list, from whatever country they may come.

Iron and Steel Duties Generally Unchanged.

Generally speaking the duties of the principal tariff on iron and steel, on staple products thereof, and on machinery, are the same as they were before. The exceptions above mentioned are nearly all there are. One other of importance is that of item 376, which makes the general, the preferential and the intermediate duties, respectively, $2.75, $1.75 and $2.50 per ton, on iron or steel billets weighing not less than 60 lb. to the yard, and on ingots, cogged ingots, blooms, slabs and puddled bars, and on loops and other forms less finished than bars but more advanced than pig iron, except castings. Under the former general tariff these were only $2 a ton.

Item No. 388A is a new one. It prescribes a duty on steel rails returned rerolled from any country to which they have been sent hence to be so made over for Canadian railroad companies. The duty, the same under all the tariffs, is to be 25 per cent., not of the value, but of the cost of rerolling. The rails must weigh not less than 56 lb. per lineal yard when rerolled. A proviso added to the item gives the Government power to abolish this duty whenever it is satisfied that a mill for rerolling such rails in substantial quantities has been established in Canada. The effect of such abolition will be to make rerolled rails subject to the regular rail duty, which, under the general tariff, is now $7 a ton.

That the Government was consciously providing for protection was admitted by Mr. Fielding almost in so many words, but he was particular to point out that his protectionism was not of the thorough going kind. He mentioned tin plate as an example of the kind of manufactured article whose production in Canada ought not to be assisted just now by a duty.

The Preferential Tariff.

As has already meen mentioned, the preferential tariff is now a matter of particular rates specified for each article coming from Great Britain or any British colony to which the preferential tariff may be extended. While on the average the duties do not materially vary from the fixed 66 2-5 per cent. ratio they previously bore to the general duties, the benefit of the preference is so distributed over the list of articles as to be more to the advantage of Britain, as compared with outside countries, though probably not more as compared with Canadian producers. One mode of favoring the mother country not previously applied is to make certain articles free only when they come from her producers. Thus salt in bulk, rated at 5 cents per 100 lb. under the general tariff, and 4 cents under the intermediate tariff, is free when coming from Great Britain. Rolled iron or steel sheets, No. 14 gauge or thinner; Canada plates, Russia iron, flat galvanized iron or steel sheets, terne plate, rolled sheets of iron or

steel coated with any other metal, galvanized or otherwise coated iron or steel hoop, hand scroll or strip, No. 14 gauge or thinner, are dutiable at 5 per cent. under the general and intermediate tariffs, and are free under the preferential tariff. It is exactly the same in the case of rolled iron or steel bars, bands, hoops, whether galvanized or not. Other articles subject to 5 per cent. under the general and intermediate tariff and free under the preferential are the following: Boiler tubes, certain tubing for the manufacture of agricultural implements, a grade of crucible cast steel wire, galvanized wire Nos. 9, 12 and 13 gauge. These grades of galvanized wire used for fence purposes were formerly on the free list, from whatever source they came. Britain has had the sole privilege of sending them in free. Steel balls for use on bearings are taxed 10 per cent. under the general tariff, 7½ under the intermediate tariff and are free under the British preference. To be entitled to the preference any article must have had 25 per cent. of its value contributed by British labor to which it was subjected, and profits of British manufacturers must not be reckoned as part of this element. Referring to the British preference Mr. Fielding said:

> On the whole, I think it will be found, as a result of our revision, that the whole tariff will be more favorable to Great Britain in the way of a preference than it is at the present moment. We desire to turn trade to Great Britain wherever we can properly do so, because Great Britain is our best customer, and if, by any arrangement we can properly make, we can turn trade from people who won't buy from us toward people who do buy from us, then we think we ought to do so.

Some idea of the manner in which the preference favors the British trade in metals has been given above. Further examples may be cited: Pig iron, rated at $2.50 under the general tariff, and at $2.25 under the intermediate tariff, is $1.50 under the British preference. Rolled iron or steel bars and rods, &c., are $7 under the general tariff, $6 under the intermediate and $4.25 under the preferential. It is the same with steel billets. Steel rails are dutiable at $7 under the general, $6 under the intermediate and $4.50 under the preferential tariff. Cast iron pipe rates are $8, $7 and $6, respectively.

Provision is made for the extension of the preference to any of the British colonies by order in Council. That is, if the Government sees fit to give the benefit of the preferential rates to Australia, for example, it is authorized to do so, without reference of the matter to Parliament.

The Intermediate Tariff.

The column of intermediate duties is the new feature of the tariff. There can be no better account given of the purpose of this tariff than the following extract from the remarks upon it in Mr. Fielding's budget speech:

> All we do, then, by adopting this intermediate tariff is to hold it up to countries abroad and say: "This is something which you may obtain, if you desire, by entering into negotiations with Canada; you may obtain the whole tariff for equal compensation, or you may obtain a part of that tariff for compensation. You may obtain it from day to day by reciprocal legislation, or you may obtain it by a treaty, brought about through proper diplomatic channels. We do not, therefore, bring this middle tariff into operation at once, but we put it before the world as a statement of the terms and conditions upon which we are willing to negotiate with other countries, and in order that we may induce them to give us better terms and take from us a larger share of products of Canada.

"Intermediate" is not well chosen as the characterizing epithet for this tariff. It is hardly speaking roughly to say that its duties stand considerably closer to those of the general tariff than to those of the general tariff. When it is remembered that the general tariff remains almost as it was before, and that the preferential tariff is changed little except in form, it will be seen that the intermediate duties must be more than two-thirds of those of the general duties, whether of the present or the immediate past. When Mr. Fielding says the reduction from general to intermediate is in no case so much as 10 per cent. he means ad valorem, for in most cases it is more than 10 per cent. of the general rate.

It is possible, as has been suggested, that the rates of the intermediate tariff are those worked out at the meetings of the Joint High Commission some years ago. The stumbling block in the way of a general settlement of the questions referred to the commission was the Alaska boundary dispute. Sir Wilfrid Laurier was determined that all the questions at issue should be included in the convention that was to be the outcome of the negotiations, and as no common ground could be found for the settlement of the boundary controversy, the meetings were discontinued. In a magazine article published after the last meeting was held, John Charlton, M. P., a Canadian member of the commission, stated that the terms of a reciprocity treaty had practically been agreed upon when the boundary snag was struck. It is thought possible that the duties named in the intermediate tariff may be those the Canadian commissioners had been prepared to concede. All this is upon the supposition that the intermediate tariff is intended to attract the attention of the United States, and lead to a reciprocal arrangement with that country. The concession of the intermediate duties would put the United States on a footing more advantageous for competing with great Britain here. In many lines the United States, having the benefit of the intermediate duties, would be able to undersell Britain here, having the benefit of the preferential duties, proximity to the Canadian market counting for more than the difference between these two grades of duty. On iron, steel and other metals, however, the intermediate duties are less favorable to the country enjoying them than are the intermediate duties on other varities of product. Pig iron, for example, is subject to a general duty of $2.50, an intermediate duty of $2.25 and a preferential duty of $1.50. Angles, ties, beams, channels, girders and other shapes, not further manufactured than rolled, are subject to a general duty of $7 a ton, an intermediate duty of $6 and a preferential duty of $4.25. Generally speaking, on metals the differential in favor of Great Britain is substantial, even as against a beneficiary of the intermediate tariff. On the whole, the intermediate tariff cannot appear to be specially inviting to the United States, not sufficiently so to induce the latter to make any very liberal concessions to Canada. Since the general tariff of to-day is practically the same as the old general tariff, and since the present preferential tariff is practically the same as the old preferential tariff, the exports of the United States and the exports of the United Kingdom to this market are likely to remain relatively about as they were. That is, without the benefit of the intermediate tariff the United States will probably continue to sell here twice as much as the United Kingdom sells here.

The Tariff for Retaliation.

The surtax feature of the former tariff law is retained. It provides that articles the produce or manufacture of any foreign country that treats imports from Canada less favorably than those from other countries may be subject to a surtax equal to one-third of the duty specified in the general tariff. At present the only country whose goods are subject to this retaliatory tariff is Germany. Hence that nation would have more to gain than any other by coming to a tariff understanding with Canada.

The Antidumping Duty.

Another feature of the former tariff that is continued is the Special duty, better known as the Antidumping duty. It is now to be of wider scope. Formerly it was applied only to goods subject to an ad valorem rate of duty. It is now unlimited in its application. Goods in which the duty is a specific sum per unit, or goods that came in free of duty may have as much as 15 per cent. ad valorem imposed upon them if it is found that they were bought at so much below the regular purchase price in the country of production. To speak precisely, the Antidumping duty is to be the difference between the buying price and the regular selling price, but is not to exceed 15 per cent. ad valorem. This special duty is to be confined to goods of a kind made in Toronto.

Antitrust Tariff.

A power contained in the old tariff law and exercised but once was that conferred on the Government to remove or reduce the duty on any article whose sale

or production was found upon judicial inquiry to be controlled by a combination or association maintained to uphold unduly by high prices. This power is also embodied in the new law.

A Liberal Drawback Arrangement.

It has been a long standing rule of Canadian tariff policy to exempt from the duty to which they were ordinarily liable certain materials used in specified lines of manufacture. The privilege thus conceded was sometimes abused, the material in question not always being turned to the particular account for which its free importation was permitted. To check this abuse it is provided in the new tariff law that on a list of the materials previously allowed in for specified purposes the full duty must be paid on importation, 95 per cent. of it to be refunded upon proof that the articles have been used as was contemplated by the waiver of duty. This new refund is to be distinguished from that of 99 per cent. of the duty paid on imported material which enters into a product manufactured in Canada and exported. Such 99 per cent. refund is claimable upon any imported material whatever upon which duty has been paid, if such material is afterward worked up into product here and exported. But there are several lines of manufacture in Canada whose imported raw materials have been exempt from the duties to which in other applications they would be liable, and that exemption was irrespective of the exportation of the finished product. Of this class was the steel used in railroad springs, in tools of a certain description, &c. Instead of being imported free hereafter for these designated purposes, these materials shall be dutiable at their regular rate for all purposes, but the manufacturers who use them in the industries the Government desires to encourage by tariff favor shall be refunded 95 per cent. of the duty. Among the articles on which the drawback of duty shall be thus conditionally payable are the following: Oil, fuel and other articles, not machinery, entering into the production of Canadian binder twine; rolled iron, rolled steel and pig iron used in the manufacture of harvest machinery; hemp bleaching compound used in the manufacture of rope; steel under 1 in. in diameter or under ½ in. square used in the manufacture of locks and knobs; steel cut in shape for the manufacture of spoons; flat spring steel, steel billets and axle bars used in the manufacture of springs and axles for nonrailway vehicles; spiral spring steel used in the manufacture of railroad spiral springs; steel used in the manufacture of cutlery, files, augers, auger bits, hammers, axes, hatchets, scythes, reaping hooks, hoes, hay knives, agricultural forks, hand rakes, skates, stone trimmings, bicycle chain and wind mills. Goods imported for any of the Government departments are likewise no longer to be free, the regular duty being payable and refundable.

But over and above the change in the mode of relieving the manufacturers of designated articles of the duty to which their material is ordinarily subject, the new drawback schedule is notable for its extension of the range of articles that are practically free when imported for particular manufacturing purposes. For the first time the manufacturers of harvest machinery have their pig iron, their rolled iron and their steel virtually placed on the free list, no matter whether their finished product is exported or sold to Canadian farmers. The harvest machinery manufacturers pay duty of $2.50 a ton on the pig iron they import from the United States, or $1.50 per ton on that they import from Great Britain. When the pig iron thus bought outside is made into harvesters and mowers the claim is made for a drawback of 99 per cent. of the duty if the machines are exported and of 95 per cent. if the machines are sold to Canadian farmers. It is the same with the imported bar iron and steel involved.

This is much more to the gain of the harvest machinery manufacturers than the reduction of 2½ per cent. ad valorem of the duty on their finished product. It will many times counterbalance the latter. It should enable the Canadian makers to hold their own against American makers' competition in the Western provinces. It will not be to the liking of Canadian producers of pig iron, rolled iron and steel, for the agricultural implement manufacturers of Canada take a large tonnage of these products.

Bounties.

The bounties on iron and steel, which were to terminate on July 1 next, have been renewed for a four-year period, the rates of last year being taken as the starting point. Another change is in the comparative rates paid on the product of Canadian ore and the product of imported ore. The existing difference of 35 cents a ton was not, in Mr. Fielding's opinion, sufficient to encourage the development of domestic mines, so he raised the inequality to $1 for each of the first three years of the period and to 50 cents for the last year. Still another change is the provision confining the bounties to iron and steel sold in Canada and excluding exports. The bounties are as follows:

a. In respect of pig iron manufactured from ore, on the proportion from Canadian ore produced during the calendar years—1907, $2.10 per ton; 1908, $2.10 per ton; 1909, $1.70 per ton; 1910, 90 cents per ton.

b. In respect of pig iron manufactured from ore on the proportion from foreign ores produced during the calendar years—1907, $1.10 per ton; 1908, $1.10 per ton; 1909, 70 cents per ton; 1910, 40 cents per ton.

c. On puddled iron bars manufactured from pig iron made in Canada during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton; 1910, 60 cents per ton.

d. In respect of rolled round wire rods not over ⅜ in. in diameter, manufactured in Canada from steel produced in Canada from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, when sold to wire manufacturers for use in making wire in their own factories in Canada, on such wire rods made after December 31, 1906, $6 per ton.

e. In respect of steel ingots manufactured from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, on such ingots made during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton; 1910, 60 cents per ton. Provided that bounty shall not be paid on steel ingots from which steel blooms and billets for exportation from Canada are manufactured.

C. A. C. J.

Ballistic Test of a Steel Locomotive Cylinder.

In *The Iron Age* of February 22, 1906, an illustration and description appeared of steel locomotive cylinders for the New York Central & Hudson River Railroad, cast at the foundry of the Penn Steel Casting & Machine Company, Chester, Pa. These were the first steel cylinders to be used in the United States. To ascertain the shock resistance of this steel a cylinder was sent by the Penn Steel Casting & Machine Company to the United States Naval Proving Ground at Indian Head, Md., where three shots were fired at a range of 15 ft. The open hearth steel entering into this cylinder showed under physical tests 76,000 lb. tensile strength, 36,000 lb. elastic limit, 28.5 per cent. elongation in 2 in., and 34.6 percentage reduction of area. The cylinder had stood a hydrostatic test of 700 lb. per sq. in. The report of the ballistic test, as made by the acting Inspector of Ordnance to the Chief of the Bureau, is as follows:

Impact No. 1. Charge, 60 grams smokeless powder, 140; muzzle velocity, 2000 ft.-sec.; 1-pdr. gun, casting about 15 ft. from muzzle. No flaking or cracks developed on the outside of the casting. Fringe even, about 17 points, ½ in. high. Fringe of metal carried away on inside around hole. Diameter of inside flaking, 2 3-42 x 2⅛ in. Thickness of metal, 1½ in.

Impact No. 2. Same charge and gun as in the first impact. The point of shell penetrated; remainder of shell rebounded. No fringe as in first impact. No cracks developed. Slight flaking around outside of hole.

Impact No. 3. Charge, 300 grams I. H. P., sun-dried; muzzle velocity, 2200 ft.-sec.; 3-pdr. gun. Fringe as in first impact. Shell penetrated about 3 in. of metal and remained in the hole. Base of shell broken off. No cracks or flaking developed.

It was found that beyond puncture no cracks or shatter of the steel had been developed by the test, which was unusual for so intricate and difficult a casting as a locomotive cylinder.

The general office of the Standard Iron Company, Goodrich, Tenn., was removed on December 1 to Nashville, Tenn., Room 416, First National Bank Building.

have acquired so much skill that the barring lever is seldom used. By manipulating the air valves just as the engine comes to rest it is not difficult to bring the air cams in starting position so that no time need be lost in barring the engine around to the position for starting.

Tar Eliminated in the Producer.

A notable feature of the producer plant is that it is capable of gasifying bituminous coals without making quantities of tar. The process is intermittent, embodying the now more or less well known system of passing the green hydrocarbon distillates through a secondary fire bed which has previously been brought up to the proper temperature by blasting with air. Since the plant was started, a fair grade of soft coal (B. R. & P. run of mine) has been used, averaging about 13,500 B.t.u. per pound. Although this coal presumably contains 35 per cent. of volatile, tar destruction in the producers is complete, but at the same time a considerable quantity of lampblack has resulted which has made it necessary to devise special means to handle this by-product. No attempt has been made to market it, as some is used in the preparation of paints for castings, &c.

Straight producer gas is not made directly, but water gas and air gas are made at alternate intervals of varying duration according to richness of the gas desired. In metallurgical plants the two gaseous products of the system are often handled separately, the water gas being used for heating furnaces on account of its high flame temperature and the blast gas in gas engines for power purposes. And it is an interesting fact that, although this blast gas would be absolutely unfit for any other use on account of its comparatively low calorific value—from 80 to 90 B.t.u. per cu. ft.—yet it is quite suitable for gas engine work, in that it is not at all snappy (as is water gas) and, therefore, permits of higher compression. At Depew the two gases are mixed in a single holder in the proportion generated.

In this system two producers constitute a unit. Usually it is desirable to have a separate unit on hand for relay purposes. Here this was especially necessary in order to provide an opportunity for freeing the producer from clinker formed during the week's run. At Depew a novel arrangement was first employed, in the form of a clover leaf with three producers united at top and bottom by T pipe connection with the necessary water cooled valves. It was then possible to renew one producer fire per week in rotation, and at the same time save the cost of a fourth producer to complete the duplicate unit. Through no fault of this arrangement, however, it was not an entire success, owing to the difficulty in preventing the leakage of water gas into the idle producer through the valves. This difficulty has now been overcome and a complete relay plant, including scrubbing equipment, is provided in the adjoining producer building with sensibly better results than before.

Producer Auxiliaries.

A feature of the system is that all steam required is generated entirely from the sensible heat of the gases coming from the producers which would otherwise be wasted in cooling water. This condition, however, obtains only when the plant is heavily loaded. Running light it would be difficult to make sufficient steam to operate the producer auxiliaries. An air auxiliary boiler would have to be drawn upon. With the high "heats" necessary in the intermittent process, this represents an important saving. The boiler, however, requires weekly cleaning.

The proper cleaning of the gas is a difficult problem, owing to the fact that lampblack does not easily adhere to a wetted surface as does ordinary cinder dust. In this plant the gas first passes upward through a wet scrubber containing several tiers of small coke constantly wetted down by water sprays. A thin layer of dry excelsior is also used in the top tiers. Emerging from the wet scrubber, the gas enters two large dry scrubbers filled with several tiers of excelsior and piped up in parallel so that the velocity of the gas is not only reduced but also the amount of gas handled by each drier. Finally, an engine driven Root's exhauster delivers the gas to the holder.

The various valve movements are handled mechanically by rack gears with operating wheels conveniently placed on the level of the operating floor.

Producer Operation.

The present method of operating the producer plant requires an air gas run of 10 to 15 minutes, according to the demand for gas at the power plant, and a water gas run from one-half to three-quarters of a minute, the resulting mixture being well suited to power work.

Frequent testing of the quality of the gas made is not now practiced on account of its uniformity under the present operating condition. The holder, of course, greatly assists in insuring uniform gas at the engines. At the same time it provides sufficient capacity for operating one unit at full load for about three-quarters of an hour; the full plant in inversely proportionate time. Storage capacity is particularly valuable when a new fire is being put into service. This is usually done during the noon hour when the load is light, so that a lowering of the heat value of the gas is relatively unimportant.

In ordinary operation it is a simple matter to observe the quality of gas by means of two sampling flames always in view of the operators. One consumes gas from the holder; the other consumes freshly made gases as they leave the dry scrubber. Any irregularities may then be readily detected. Calorimeter tests show the gas as made at the present time to average slightly above 100 B.t.u. per cu. ft. (see Table 5). This comparatively low heat value is, of course, due to the preponderating period of blasting. With the rate of water gas mixing practically fixed, the only variable factor to compensate for varying demands for gas is the rate of blasting; hence, there is a long and subdued air gas run with a rapid but short run on water gas. During the second test (Table 5) the gas consumption was observed to be about 1,100 cu. ft. per minute at a load of 395 kw. This is equivalent to 167 cu. ft. per kw.h. at seven-eighths load on the generating units, and represents approximately a duty of 16,700 B.t.u. per kw.h., or a little over 11,000 B.t.u. per b.h.p. hour.

Coal consumption is determined by direct weighing in the producer house. Each shift weighs up enough coal at the start to run the plant through twelve hours; should there be a surplus at the end, it is weighed back and charged to the next shift, thus making each shift responsible for all fuel used during their run.

The entire producer plant is operated throughout the week by four men, two to a shift, with some additional labor on Sundays for cleaning. All the attendants were unskilled foreigners before taking up the producer work. During a half day shut down of the plant on Sundays, all renovating of the producer equipment is done; boiler tubes are cleaned, wet scrubber washed down, the excelsior in the dry scrubbers taken out and shaken free from lampblack, gas mains flushed out and a new fire started in the idle producer. At the same time, another producer is taken out of service, fires are drawn, and during the week, after it has had an opportunity to cool off, the hard clinker, which adheres to the lining, is broken off. For the starting layer of a new firebed, coke is used to the extent of some 3,000 lb. per producer, a sufficient quantity to affect the coal consumption of the succeeding day. If allowed to form to any extent, clinker constitutes a frequent source of trouble in operating the plant, and it is important that the selection of coal be made with this in view. With fires fairly free from clinker the suction required for blasting may be only 8 to 10 in. of water, but with fires badly clinkered it may run up to 25 in. With 10 to 15 in. drop in the scrubbers, this imposes from 30 to 40 in. suction on the exhauster, thus largely increasing its steam consumption.

Table V.—Characteristics of Power Gas.—Typical Analysis.

Date, June, 1905	20th.	21st.	23d.
Number of hours test	3	10	10
Intervals of tests (minutes)	15	15	15
Minimum calorific value	98	91	91
Maximum calorific value	113	110	104
Average calorific value	105	100	100
Maximum variation from average	7½%	10%	9%

Date.	H.	CO.	CH_4	O.	CO_2	N.
September 9, 1905	9.50	21.0	1.9	0.6	6.5	60.9
September 12, 1905	10.13	22.8	2.2	0.4	5.6	58.9

Canada's Triple Tariff.

Analysis of the Tariff Put in Effect November 30.

TORONTO, December 1, 1906.—Mr. Fielding has contrived to impress upon his new tariff nearly all the characteristics by which tariffs are classified. Instead of being this or that kind of tariff, it is of all kinds. It can be praised or condemned, according to the point of view, as a tariff for revenue, as a tariff for freer trade, as a tariff for protection, as a tariff for preferential trade with Great Britain, as a tariff for reciprocity. The scheme has been most skilfully designed to humor every division of opinion on the subject of fiscal policy. Dissatisfaction there was bound to be from some quarter, no matter what form the revision should assume, and it may be that Mr. Fielding has provoked some in all quarters, but it must be said that such as has been heard from up to the present is of a mild character. Nobody seems to be very furious. Quite possibly the judgment or wrath of some interests is only suspended until the full meaning of the measure is grasped, for the details of the somewhat complex arrangement will not be mastered in a hasty reading of a newspaper report of it. At the present moment the tariff experts of the Canadian Manufacturers' Association are studying its schedules, and the Ministers will doubtless soon hear what the association thinks of it.

Drawn up in its three columns the new tariff looks quite formidable, but as a matter of fact there are not more lists of duties in force now than there were before the budget was presented. The three columns are under the following heads: "The British Preference," "The Intermediate," "The General." The intermediate tariff is not in effect, and will not be put in effect except as a concession of reciprocity to any given country or countries. There were a general tariff and a British preferential tariff before, but as the rates of the latter were uniformly two-thirds of those of the former there was no need to exhibit the duties on British goods in a separate list. Mr. Fielding decided to abandon this invariable ratio of the preferential duties to the general duties, as it appeared to him that on some goods the flat discount of 33 1-3 per cent. was unduly large. He therefore worked out an independent tariff for the benefit of the British, making the concessions more liberal where there was more advantage of foreign competitors of Britain to be overcome here, and making it less liberal where interests of home producers seemed to be entitled to more protection.

The General Tariff.

While rather numerous, the changes in the general tariff are so unimportant that it can hardly be supposed they would have been made if the plan of a single column of duties had been adhered to. They were determined apparently as adjustments to the other parts of the scheme—the new preferential table of duties and the intermediate table. Switches, frogs, crossings and intersections for railroads, for example, are rated 32½ per cent. under the new general tariff, as against 30 per cent. under the old one—the reason for the change presumably being that it was thought desirable to make the intermediate duty 30 per cent. and the preferential 20 per cent. Axes, scythes, straw knives, hoes, rakes and pronged forks were 25 per cent. under the old general tariff and are 22½ under the new, the preferential and intermediate rates being 15 and 20 per cent., respectively. Mowing machines, harvesters, self-binders and reapers, which were dutiable at 20 per cent. under the old general tariff, are reduced to 17½ per cent. under the new, the preferential and intermediate duties being 12½ and 17½, respectively. Threshing machine outfits, consisting of traction or portable engine and separator, were rated at 25 per cent. under the old general tariff and are 20 per cent. under the new, the preferential and intermediate rates being 15 and 17½ per cent. Shovels and spades, and blanks for the same, and lawn mowers, 35 per cent. under the old general tariff, are 32½ per cent. under the new, and 20 and 30 per cent., respectively, under the preferential and intermediate tariffs. Mold boards, plowshares, landsides, &c., when cut to shape but not otherwise manufactured, are now free, whencesoever they come, though formerly the general duty on them was 5 per cent. Most of the examples above adduced are from the list of articles used by farmers, and illustrate changes on the side of reduction of duty. Unquestionably it was the desire of the Government to obtain credit for lowering the duties on articles used by that class of producers, even though the relief conceded might not be very great. On the other hand, as is shown below, galvanized wire for fencing, which was free before, is now subject to a duty of 5 per cent., except when imported from Great Britain. Barbed wire, also formerly free, appears now to be comprehended in item No. 406 as "Wire of all metals and kinds not otherwise provided for," and made dutiable at rates of 20, 10 and 12½ per cent., according as it is imported under the general, the preferential or the intermediate tariff. It is interesting to note, in connection with these changes affecting wire, that wire rods are still on the free list, from whatever country they may come.

ron and Steel Duties Generally Unchanged.

Generally speaking the duties of the principal tariff on iron and steel, on staple products thereof, and on machinery, are the same as they were before. The exceptions above mentioned are nearly all there are. One other of importance is that of item 376, which makes the general, the preferential and the intermediate duties, respectively, $2.75, $1.75 and $2.50 per ton, on iron or steel billets weighing not less than 60 lb. to the yard, and on ingots, cogged ingots, blooms, slabs and puddled bars, and on loops and other forms less finished than bars but more advanced than pig iron, except castings. Under the former general tariff these were only $2 a ton.

Item No. 388A is a new one. It prescribes a duty on steel rails returned rerolled from any country to which they have been sent hence to be so made over for Canadian railroad companies. The duty, the same under all the tariffs, is to be 25 per cent., not of the value, but of the cost of rerolling. The rails must weigh not less than 56 lb. per lineal yard when rerolled. A proviso added to the item gives the Government power to abolish this duty whenever it is satisfied that a mill for rerolling such rails in substantial quantities has been established in Canada. The effect of such abolition will be to make rerolled rails subject to the regular rail duty, which, under the general tariff, is now $7 a ton.

That the Government was consciously providing for protection was admitted by Mr. Fielding almost in so many words, but he was particular to point out that his protectionism was not of the thorough going kind. He mentioned tin plate as an example of the kind of manufactured article whose production in Canada ought not to be assisted just now by a duty.

The Preferential Tariff.

As has already meen mentioned, the preferential tariff is now a matter of particular rates specified for each article coming from Great Britain or any British colony to which the preferential tariff may be extended. While on the average the duties do not materially vary from the fixed 66 2-5 per cent. ratio they previously bore to the general duties, the benefit of the preference is so distributed over the list of articles as to be more to the advantage of Britain, as compared with outside countries, though probably not more as compared with Canadian producers. One mode of favoring the mother country not previously applied is to make certain articles free only when they come from her producers. Thus salt in bulk, rated at 5 cents per 100 lb. under the general tariff, and 4 cents under the intermediate tariff, is free when coming from Great Britain. Rolled iron or steel sheets, No. 14 gauge or thinner; Canada plates, Russia iron, flat galvanized iron or steel sheets, terne plate, rolled sheets of iron or

steel coated with any other metal, galvanized or otherwise coated iron or steel hoop, hand scroll or strip, No. 14 gauge or thinner, are dutiable at 5 per cent. under the general and intermediate tariffs, and are free under the preferential tariff. It is exactly the same in the case of rolled iron or steel bars, bands, hoops, whether galvanized or not. Other articles subject to 5 per cent. under the general and intermediate tariff and free under the preferential are the following: Boiler tubes, certain tubing for the manufacture of agricultural implements, a grade of crucible cast steel wire, galvanized wire Nos. 9, 12 and 13 gauge. These grades of galvanized wire used for fence purposes were formerly on the free list, from whatever source they came. Britain has had the sole privilege of sending them in free. Steel balls for use on bearings are taxed 10 per cent. under the general tariff, 7½ under the intermediate tariff and are free under the British preference. To be entitled to the preference any article must have had 25 per cent. of its value contributed by British labor to which it was subjected, and profits of British manufacturers must not be reckoned as part of this element. Referring to the British preference Mr. Fielding said:

> On the whole, I think it will be found, as a result of our revision, that the whole tariff will be more favorable to Great Britain in the way of a preference than it is at the present moment. We desire to turn trade to Great Britain wherever we can properly do so, because Great Britain is our best customer, and if, by any arrangement we can properly make, we can turn trade from people who won't buy from us toward people who do buy from us, then we think we ought to do so.

Some idea of the manner in which the preference favors the British trade in metals has been given above. Further examples may be cited: Pig iron, rated at $2.50 under the general tariff, and at $2.25 under the intermediate tariff, is $1.50 under the British preference. Rolled iron or steel bars and rods, &c., are $7 under the general tariff, $6 under the intermediate and $4.25 under the preferential. It is the same with steel billets. Steel rails are dutiable at $7 under the general, $6 under the intermediate and $4.50 under the preferential tariff. Cast iron pipe rates are $8, $7 and $6, respectively.

Provision is made for the extension of the preference to any of the British colonies by order in Council. That is, if the Government sees fit to give the benefit of the preferential rates to Australia, for example, it is authorized to do so, without reference of the matter to Parliament.

The Intermediate Tariff.

The column of intermediate duties is the new feature of the tariff. There can be no better account given of the purpose of this tariff than the following extract from the remarks upon it in Mr. Fielding's budget speech:

> All we do, then, by adopting this intermediate tariff is to hold it up to countries abroad and say: "This is something which you may obtain, if you desire, by entering into negotiations with Canada; you may obtain the whole tariff for equal compensation, or you may obtain a part of that tariff for compensation. You may obtain it from day to day by reciprocal legislation, or you may obtain it by a treaty, brought about through proper diplomatic channels. We do not, therefore, bring this middle tariff into operation at once, but we put it before the world as a statement of the terms and conditions upon which we are willing to negotiate with other countries, and in order that we may induce them to give us better terms and take from us a larger share of products of Canada.

"Intermediate" is not well chosen as the characterizing epithet for this tariff. It is hardly speaking roughly to say that its duties stand considerably closer to those of the general tariff than to those of the general tariff. When it is remembered that the general tariff remains almost as it was before, and that the preferential tariff is changed little except in form, it will be seen that the intermediate duties must be more than two-thirds of those of the general duties, whether of the present or the immediate past. When Mr. Fielding says the reduction from general to intermediate is in no case so much as 10 per cent. he means ad valorem, for in most cases it is more than 10 per cent. of the general rate.

It is possible, as has been suggested, that the rates of the intermediate tariff are those worked out at the meetings of the Joint High Commission some years ago. The stumbling block in the way of a general settlement of the questions referred to the commission was the Alaska boundary dispute. Sir Wilfrid Laurier was determined that all the questions at issue should be included in the convention that was to be the outcome of the negotiations, and as no common ground could be found for the settlement of the boundary controversy, the meetings were discontinued. In a magazine article published after the last meeting was held, John Charlton, M. P., a Canadian member of the commission, stated that the terms of a reciprocity treaty had practically been agreed upon when the boundary snag was struck. It is thought possible that the duties named in the intermediate tariff may be those the Canadian commissioners had been prepared to concede. All this is upon the supposition that the intermediate tariff is intended to attract the attention of the United States, and lead to a reciprocal arrangement with that country. The concession of the intermediate duties would put the United States on a footing more advantageous for competing with great Britain here. In many lines the United States, having the benefit of the intermediate duties, would be able to undersell Britain here, having the benefit of the preferential duties, proximity to the Canadian market counting for more than the difference between these two grades of duty. On iron, steel and other metals, however, the intermediate duties are less favorable to the country enjoying them than are the intermediate duties on other varities of product. Pig iron, for example, is subject to a general duty of $2.50, an intermediate duty of $2.25 and a preferential duty of $1.50. Angles, ties, beams, channels, girders and other shapes, not further manufactured than rolled, are subject to a general duty of $7 a ton, an intermediate duty of $6 and a preferential duty of $4.25. Generally speaking, on metals the differential in favor of Great Britain is substantial, even as against a beneficiary of the intermediate tariff. On the whole, the intermediate tariff cannot appear to be specially inviting to the United States, not sufficiently so to induce the latter to make any very liberal concessions to Canada. Since the general tariff of to-day is practically the same as the old general tariff, and since the present preferential tariff is practically the same as the old preferential tariff, the exports of the United States and the exports of the United Kingdom to this market are likely to remain relatively about as they were. That is, without the benefit of the intermediate tariff the United States will probably continue to sell here twice as much as the United Kingdom sells here.

The Tariff for Retaliation.

The surtax feature of the former tariff law is retained. It provides that articles the produce or manufacture of any foreign country that treats imports from Canada less favorably than those from other countries may be subject to a surtax equal to one-third of the duty specified in the general tariff. At present the only country whose goods are subject to this retaliatory tariff is Germany. Hence that nation would have more to gain than any other by coming to a tariff understanding with Canada.

The Antidumping Duty.

Another feature of the former tariff that is continued is the Special duty, better known as the Antidumping duty. It is now to be of wider scope. Formerly it was applied only to goods subject to an ad valorem rate of duty. It is now unlimited in its application. Goods in which the duty is a specific sum per unit, or goods that came in free of duty may have as much as 15 per cent. ad valorem imposed upon them if it is found that they were bought at so much below the regular purchase price in the country of production. To speak precisely, the Antidumping duty is to be the difference between the buying price and the regular selling price, but is not to exceed 15 per cent. ad valorem. This special duty is to be confined to goods of a kind made in Toronto.

Antitrust Tariff.

A power contained in the old tariff law and exercised but once was that conferred on the Government to remove or reduce the duty on any article whose sale

or production was found upon judicial inquiry to be controlled by a combination or association maintained to uphold unduly by high prices. This power is also embodied in the new law.

A Liberal Drawback Arrangement.

It has been a long standing rule of Canadian tariff policy to exempt from the duty to which they were ordinarily liable certain materials used in specified lines of manufacture. The privilege thus conceded was sometimes abused, the material in question not always being turned to the particular account for which its free importation was permitted. To check this abuse it is provided in the new tariff law that on a list of the materials previously allowed in for specified purposes the full duty must be paid on importation, 95 per cent. of it to be refunded upon proof that the articles have been used as was contemplated by the waiver of duty. This new refund is to be distinguished from that of 99 per cent. of the duty paid on imported material which enters into a product manufactured in Canada and exported. Such 99 per cent. refund is claimable upon any imported material whatever upon which duty has been paid, if such material is afterward worked up into product here and exported. But there are several lines of manufacture in Canada whose imported raw materials have been exempt from the duties to which in other applications they would be liable, and that exemption was irrespective of the exportation of the finished product. Of this class was the steel used in railroad springs, in tools of a certain description, &c. Instead of being imported free hereafter for these designated purposes, these materials shall be dutiable at their regular rate for all purposes, but the manufacturers who use them in the industries the Government desires to encourage by tariff favor shall be refunded 95 per cent. of the duty. Among the articles on which the drawback of duty shall be thus conditionally payable are the following: Oil, fuel and other articles, not machinery, entering into the production of Canadian binder twine; rolled iron, rolled steel and pig iron used in the manufacture of harvest machinery; hemp bleaching compound used in the manufacture of rope; steel under 1 in. in diameter or under ½ in. square used in the manufacture of locks and knobs; steel cut in shape for the manufacture of spoons; flat spring steel, steel billets and axle bars used in the manufacture of springs and axles for nonrailway vehicles; spiral spring steel used in the manufacture of railroad spiral springs; steel used in the manufacture of cutlery, files, augers, auger bits, hammers, axes, hatchets, scythes, reaping hooks, hoes, hay knives, agricultural forks, hand rakes, skates, stone trimmings, bicycle chain and wind mills. Goods imported for any of the Government departments are likewise no longer to be free, the regular duty being payable and refundable.

But over and above the change in the mode of relieving the manufacturers of designated articles of the duty to which their material is ordinarily subject, the new drawback schedule is notable for its extension of the range of articles that are practically free when imported for particular manufacturing purposes. For the first time the manufacturers of harvest machinery have their pig iron, their rolled iron and their steel virtually placed on the free list, no matter whether their finished product is exported or sold to Canadian farmers. The harvest machinery manufacturers pay duty of $2.50 a ton on the pig iron they import from the United States, or $1.50 per ton on that they import from Great Britain. When the pig iron thus bought outside is made into harvesters and mowers the claim is made for a drawback of 99 per cent. of the duty if the machines are exported and of 95 per cent. if the machines are sold to Canadian farmers. It is the same with the imported bar iron and steel involved.

This is much more to the gain of the harvest machinery manufacturers than the reduction of 2½ per cent. ad valorem of the duty on their finished product. It will many times counterbalance the latter. It should enable the Canadian makers to hold their own against American makers' competition in the Western provinces. It will not be to the liking of Canadian producers of pig iron, rolled iron and steel, for the agricultural implement manufacturers of Canada take a large tonnage of these products.

Bounties.

The bounties on iron and steel, which were to terminate on July 1 next, have been renewed for a four-year period, the rates of last year being taken as the starting point. Another change is in the comparative rates paid on the product of Canadian ore and the product of imported ore. The existing difference of 35 cents a ton was not, in Mr. Fielding's opinion, sufficient to encourage the development of domestic mines, so he raised the inequality to $1 for each of the first three years of the period and to 50 cents for the last year. Still another change is the provision confining the bounties to iron and steel sold in Canada and excluding exports. The bounties are as follows:

a. In respect of pig iron manufactured from ore, on the proportion from Canadian ore produced during the calendar years—1907, $2.10 per ton; 1908, $2.10 per ton; 1909, $1.70 per ton; 1910, 90 cents per ton.

b. In respect of pig iron manufactured from ore on the proportion from foreign ores produced during the calendar years—1907, $1.10 per ton; 1908, $1.10 per ton; 1909, 70 cents per ton; 1910, 40 cents per ton.

c. On puddled iron bars manufactured from pig iron made in Canada during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton; 1910, 60 cents per ton.

d. In respect of rolled round wire rods not over ⅜ in. in diameter, manufactured in Canada from steel produced in Canada from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, when sold to wire manufacturers for use in making wire in their own factories in Canada, on such wire rods made after December 31, 1906, $6 per ton.

e. In respect of steel ingots manufactured from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, on such ingots made during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton; 1910, 60 cents per ton. Provided that bounty shall not be paid on steel ingots from which steel blooms and billets for exportation from Canada are manufactured.

C. A. C. J.

Ballistic Test of a Steel Locomotive Cylinder.

In *The Iron Age* of February 22, 1906, an illustration and description appeared of steel locomotive cylinders for the New York Central & Hudson River Railroad, cast at the foundry of the Penn Steel Casting & Machine Company, Chester, Pa. These were the first steel cylinders to be used in the United States. To ascertain the shock resistance of this steel a cylinder was sent by the Penn Steel Casting & Machine Company to the United States Naval Proving Ground at Indian Head, Md., where three shots were fired at a range of 15 ft. The open hearth steel entering into this cylinder showed under physical tests 76,000 lb. tensile strength, 36,000 lb. elastic limit, 28.5 per cent. elongation in 2 in., and 34.6 percentage reduction of area. The cylinder had stood a hydrostatic test of 700 lb. per sq. in. The report of the ballistic test, as made by the acting Inspector of Ordnance to the Chief of the Bureau, is as follows:

Impact No. 1. Charge, 60 grams smokeless powder, 140; muzzle velocity, 2000 ft.-sec.; 1-pdr. gun, casting about 15 ft. from muzzle. No flaking or cracks developed on the outside of the casting. Fringe even, about 17 points, ⅛ in. high. Fringe of metal carried away on inside around hole. Diameter of inside flaking, 2 3-42 x 2⅛ in. Thickness of metal, 1½ in.

Impact No. 2. Same charge and gun as in the first impact. The point of shell penetrated; remainder of shell rebounded. No fringe as in first impact. No cracks developed. Slight flaking around outside of hole.

Impact No. 3. Charge, 300 grams I. H. P., sun-dried; muzzle velocity, 2200 ft.-sec.; 3-pdr. gun. Fringe as in first impact. Shell penetrated about 3 in. of metal and remained in the hole. Base of shell broken off. No cracks or flaking developed.

It was found that beyond puncture no cracks or shatter of the steel had been developed by the test, which was unusual for so intricate and difficult a casting as a locomotive cylinder.

The general office of the Standard Iron Company, Goodrich, Tenn., was removed on December 1 to Nashville, Tenn., Room 416, First National Bank Building.

THE NEW CANADIAN TARIFF.

OTTAWA, December 1, 1906.—The greatest gain for the Canadian iron and steel industry in the new tariff is the continuation of the iron and steel bounties. These bounties would have expired in July, 1907, but they are to be continued for another four years, and for three years to come the rate per ton is to be higher than the level at which it now stands.

"We are inclined to think," said Mr. Fielding, the Minister of Finance, who represents a Nova Scotia constituency in the House of Commons, in his explanatory statement on the Budget, "from the best information we have that it will be necessary for the Government to encourage this industry for a short period further by a system of bounties. Beginning on January 1 we propose to take the bounties of a year ago as a starting point, and so arrange them that they will run out at the end of four years. While we wish to encourage the iron industry generally, we particularly want to encourage iron made from native ore in order to encourage the development of the ores of Canada. We therefore make a special scale of rates for iron from native ore, the object of which is to show a more decided difference in favor of native ore than would be shown by adopting the old sliding scale.

"We propose," added Mr. Fielding, "that these bounties shall not apply to articles exported. There are rumors that the great Steel Trust of the United States may come into Canada to do business. If it comes into Canada to do business in the ordinary way, well and good. But if it comes here to make iron and steel for export it might add largely to our burdens. We think it well to have it understood that we are giving these bounties for the encouragement of iron and steel for consumption in Canada, and if any parties undertake to export these articles they will not be entitled to the bounty upon them. Then there are bounties at present on angles, plates and wire rods. With respect to angles and plates there is a bounty of $3 and a duty of 10 per cent. We have decided to abolish the bounty and to allow these articles to fall, as a rule, into a third class at $7 per ton, subject to the preferential reduction. The result of the change is to give them about the same degree of protection, but to get rid of the bounties."

The Liberal party—the party which is now in power at Ottawa— in its old days in opposition strenuously condemned the bounty system as it was originated by the Conservatives in the national policy tariffs between 1878 and 1896. Year in and year out in those days the Liberals were hostile to the system. How much the Liberal party has changed its position since 1896 may be judged from Mr. Fielding's general statement in support of a continuation of bounties to the iron and steel industry. "I think," he told the House of Commons, in which there are still many Liberals who used to condemn the system, "that those who condemn bounties generally do not stop to consider what would happen if we did not adopt this system. If we did not adopt the bounty system then unquestionably we should be obliged to increase the duties on iron or to allow industries of a considerable character probably to close up, and we do not think it desirable."

It has been the policy of the Government in revising the tariff to throw as much business as possible to Great Britain. This has been done wherever it would not conflict with Canadian manufacturing interests, and in no part of the tariff is this policy more obvious than in the iron and steel schedules. In referring to these schedules, Mr. Fielding frankly stated that this had been the policy of the Government. The old free list, as such, disappears from the new tariff, and every article of trade, whether free or dutiable, is grouped in its class, with the rate of duty or the statement that it is free. Many articles which were formerly in the free list are now dutiable when imported from the United States or other non-British countries, but are free when imported from Great Britain. These changes from the free to the dutiable list are more common in the iron and steel schedules than in any other group or class in the tariff, and all these changes have been made with a view to diverting trade from the United States to Great Britain.

The new feature of the tariff is the intermediate list, in which the rates of duty are one-tenth off the general list. This intermediate tariff, however, can have little more than an academic interest for a long time to come, for the obstacles in the way of bringing it into operation are considerable. Mr. Fielding did not speak hopefully about it. He admitted the obstacles. Chief among them is the favored nation clauses in British treaties by which the Dominion of Canada is bound.

Readers of *The Iron Age* who followed the special correspondence which appeared in these columns when the Tariff Commission was touring Canada last winter will remember that much pressure was brought to bear upon the Commission to insure the establishment of tonnage bounties for steel shipbuilding. There is no provision for shipbuilding bounties in the new tariff, but this question, and other questions affecting the marine policy of Canada, are to be dealt with in later legislation; and now that the steel bounties have been continued it is pretty certain that bounties will be established to aid Canadian shipbuilding. The question closely affects the Maritime Provinces, as does the question of iron and steel bounties, and in matters of this kind Nova Scotia and New Brunswick usually get what they ask for at Ottawa.

Accompanying is a statement of the duties—preferential and general—now levied on the imports of iron and steel and other articles of metal. The new tariff has not yet received the sanction of Parliament. It may not get through the House of Commons and the Senate much before the close of 1906, but, as in England, the new schedules go into operation at the customs houses just as soon as the Minister of Finance has made his Budget statement to the House of Commons. E. P.

The New Iron and Steel and Metal Schedules.

		British preferential tariff.	Intermediate tariff.	General tariff.
337.	Lead, old, scrap, pig and block	10 %	15 %	15 %
338.	Lead, in bars and in sheets	15 %	22½ %	25 %
339.	Lead, manufactures of, n.o.p.	20 %	27½ %	30 %
340.	Type for printing, including chases, quoins and slugs, of all kinds	12½ %	17½ %	20 %
341.	Babbitt metal and type metal, in blocks, bars, plates and sheets	10 %	15 %	15 %
342.	Phosphor tin and phosphor bronze in blocks, bars, plates, sheets and wire	5 %	7½ %	10 %
344.	Japanned ware, tinware and all manufactures of tin, n.o.p.	15 %	22½ %	25 %
346.	Zinc, manufactures of, n.o.p.	15 %	22½ %	25 %
349.	Brass in bars and rods, in coil or otherwise, not less than 6 ft. in length, and brass in strips, sheets or plates, not polished, planished or coated	5 %	7½ %	10 %
350.	Brass wire, plain	7½ %	10 %	12½ %
351.	Copper wire, plain, tinned or plated	7½ %	10 %	12½ %
352.	Brass and copper nails, tacks, rivets and burrs or washers; bells and gongs, n.o.p.; and manufactures of brass or copper, n.o.p.	20 %	27½ %	30 %
354.	Manufactures of aluminum, n.o.p.	15 %	22½ %	25 %
356.	Nickel, nickel silver and German silver, in bars and rods, in coil or otherwise, not less than 6 ft. in length, and also in strips, sheets or plates	5 %	7½ %	10 %
357.	Britannia metal, nickel silver, Nevada and German silver, manufactures of, not plated, n.o.p.	17½ %	27½ %	30 %
362.	Articles consisting wholly or in part of sterling or other silverware, nickel plated ware, gilt or electroplated ware, n.o.p.; manufactures of gold and silver, n.o.p.	22½ %	30 %	35 %
368.	Clocks, watches, time recorders, watch glasses, clock and watch keys, clock cases and clock movements	20 %	27½ %	30 %
374.	Iron or steel scrap, wrought, being waste or refuse, including punchings, cuttings or clippings of iron or steel plates or sheets having been in actual use; crop ends of tin plate bars, or of blooms, or of rails, the same not having been in actual use, per ton	70c.	90c.	$1.00
	But nothing shall be deemed scrap iron or scrap steel except waste or refuse iron or steel fit only to be remanufactured in rolling mills or furnaces; provided that articles of iron or			

steel, damaged in transit, if broken up under customs supervision and rendered unsalable except as scrap, may be entered for duty as scrap.			
375. Iron in pigs, iron kentledge, and cast scrap iron; ferrosilicon, ferromanganese and spiegeleisen,			
376. Iron or steel billets, weighing not less than 60 lb. per lineal yard; ingots, cogged ingots, blooms, slabs, puddled bars; and loops or other forms, n.o.p., less finished than iron or steel bars but more advanced than pig iron, except castings, per ton	$1.75	$2.50	$2.75
per ton	$1.50	$2.25	$2.50
377. Rolled iron or steel angles, tees, beams, channels, girders and other rolled shapes or sections, not punched, drilled or further manufactured than rolled, per ton	$4.25	$6.00	$7.00
378. Bar iron or steel, rolled, whether in coils, rods, bars or bundles, comprising rounds, ovals and squares, and flats; steel billets, n.o.p.; and rolled iron or steel hoop, band, scroll or strip, 12 in. or less in width, number 13 gauge and thicker, n.o.p.	$4.25	$6.00	$7.00
379. Rolled iron or steel beams, channels and angle bars, weighing not less than 40 lb. per lineal yard, and universal mill or rolled edge plates of steel, over 12 in. wide, for use in the manufacture of bridges, when imported by manufacturers of bridges	5 %	10 %	10 %
380. Rolled iron or steel plates, not less than 30 in. in width, and not less than ¼ in. in thickness, when imported by manufacturers of boilers for use in the manufacture of boilers	5 %	10 %	10 %
381. Rolled iron or steel plates, not less than 48 in. in width, and exceeding ½ in. in thickness, n.o.p.	5 %	10 %	10 %
382. Rolled iron or steel sheets or plates, sheared or unsheared, and skelp iron or steel, sheared or rolled in grooves, n.o.p.	$4.25	$6.00	$7.00
383. Skelp iron or steel, sheared or rolled in grooves, when imported by manufacturers of wrought iron or steel pipe for use only in the manufacture of wrought iron or steel pipe in their own factories	5 %	5 %	5 %
384. Rolled iron or steel sheets, No. 14 gauge and thinner, n.o.p.; Canada plates; Russia iron; flat galvanized iron or steel sheets; terne plate and rolled sheets of iron or steel, coated with zinc, spelter or other metal, of all widths or thicknesses, n.o.p.; and rolled iron or steel hoop, band, scroll or strip, No. 14 gauge and thinner, galvanized, or coated with other metal, or not, n.o.p.	Free.	5 %	5 %
385. Chrome steel	10 %	12½ %	15 %
386. Rolled iron or steel, bars, bands, hoop, scroll or strip, sheet or plate, of any size, thickness or width, galvanized or coated with any material or not, and cast steel, when of greater value than 3½ cents per pound, n.o.p.	Free.	5 %	5 %
387. Swedish rolled iron and Swedish rolled steel nail rods, under ½ in. in diameter, for the manufacture of horseshoe nails	10 %	12½ %	15 %
388. Iron and steel railway bars or rails of any form, punched or not, n.o.p. for railroads, which term for the purposes of this item shall include all kinds of railroads, street railroads and tramways, even although they are used for private purposes only, and even although they are not used or intended to be used in connection with the business of common carrying of goods or passengers, per ton	$4.50	$6.00	$7.00
388A. Iron or steel railroad bars or rails, which have been used in Canada and which have been exported from Canada and returned thereto after having been rerolled, and weighing not less than 56 lb. per lineal yard when rerolled, and on their own tracks, under regulations prescribed by the Minister of Customs	25 %	25 %	25 %
Provided that the value for duty of such rerolled rails shall be the cost of rerolling the same.			
Provided also that whenever the Governor in Council is satisfied that a mill adapted and equipped for rerolling such rails in substantial quantities has been established in Canada, the Governor in Council may by Order in Council, to be published in the Canada *Gazette*, abolish the duty specified in this item, and thereupon all such rails when imported shall be subject to such duty as otherwise provided in the customs tariff.			
389. Railroad fish plates and tie plates, per ton	$5.00	$7.00	$8.00
390. Switches, frogs, crossings and intersections for railroads	20 %	30 %	32½ %
391. Iron or steel bridges, or parts thereof; iron or steel structural work, columns, shapes or sections, drilled, punched or in any further stage of manufacture than as rolled or cast, n.o.p.	22½ %	30 %	35 %
392. Springs, axles, axle bars, n.o.p., and axle blanks and parts thereof, of iron or steel, for railroad, tramway or other vehicles	22½ %	30 %	35 %
393. Forgings of iron or steel of whatever shape or size or in whatever stage of manufacture, n.o.p.; and steel shafting, turned, compressed or polished; and hammered, drawn or cold rolled iron or steel bars or shapes, n.o.p.	20 %	27½ %	30 %
394. Cast iron pipe of every description, per ton	$6.00	$7.00	$8.00
395. Wrought or seamless iron or steel tubes for boilers, n.o.p., under regulations prescribed by the Minister of Customs; flues and corrugated tubes for marine boilers	Free.	5 %	5 %
396. Seamless steel tubing, valued at not less than 3½ cents per pound; rolled or drawn square tubing of iron or steel, adapted for use in the manufacture of agricultural implements	Free.	5 %	5 %
397. Tubes of rolled iron or steel, not joined or welded, not more than ½ in. in diameter, n.o.p.	5 %	7½ %	10 %
398. Wrought or seamless iron or steel tubing, plain or galvanized, threaded and coupled, or not, over 4 in. in diameter, n.o.p.	10 %	12½ %	15 %
399. Wrought or seamless iron or steel tubing, plain or galvanized, threaded and coupled, or not, 4 in. or less in diameter, n.o.p.	20 %	30 %	35 %
400. Iron or steel pipe or tubing, plain or galvanized, riveted, corrugated, or otherwise specially manufactured, including lock joint pipe, n.o.p.	20 %	27½ %	30 %
401. Wire bound wooden pipe	15 %	22½ %	25 %
402. Iron or steel fittings for iron or steel pipe, of every description	20 %	27½ %	30 %
403. Wire, crucible cast steel, valued at not less than 6 cents per pound	Free.	5 %	5 %
404. Galvanized iron or steel wire, Nos. 9, 12 and 13 gauge	Free.	5 %	5 %
405. Buckthorn strip fencing, woven wire fencing, and wire fencing of iron or steel, n.o.p., not to include woven wire or netting made from wire smaller than No. 14 gauge nor to include fencing of wire larger than No. 9 gauge	10 %	12½ %	15 %
406. Wire of all metals and kinds, n.o.p.	15 %	17½ %	20 %
407. Wire, single or several, covered with cotton, linen, silk, rubber or other material, including cable so covered, n.o.p.	20 %	27½ %	30 %
408. Wire rope, stranded or twisted wire, clothes lines, picture or other twisted wire and wire cable, n.o.p.	17½ %	22½ %	25 %
409. Wire cloth or woven wire, and wire netting, of iron or steel	20 %	27½ %	30 %
410. Coil chain, coil chain links, and chain shackles, of iron or steel, 5-16 in. in diameter and over	5 %	5 %	5 %
411. Malleable sprocket or link belting chain	15 %	17½ %	20 %
412. Iron or steel nuts, washers, rivets, and bolts, with or without threads; nut, bolt and hinge blanks; and T and strap hinges of all kinds, n.o.p., per 100 lbs.	75c.	75c.	75c.
and	10 %	20 %	25 %
413. Screws, commonly called "wood screws," of iron or steel, brass or other metal, including lag or coach screws, plated or not, and machine or other screws, n.o.p.	22½ %	30 %	35 %
414. Iron or steel cut nails and spikes, (ordinary builders'); and railroad spikes per 100 lb.	30c.	45c.	50c.
415. Composition nails and spikes and sheathing nails	10 %	12½ %	15 %
416. Wire nails of all kinds, n.o.p., per 100 lb.	40c.	55c.	60c.
417. Nails, brads, spikes and tacks of all kinds, n.o.p.	20 %	30 %	35 %
418. Wire cloth, or woven wire of brass or copper	17½ %	22½ %	25 %
419. Needles, of any material or kind, and pins manufactured from wire of any metal, n.o.p.	20 %	27½ %	30 %
420. Buckles of iron, steel, brass or copper, of all kinds, n.o.p., (not being jewelry)	20 %	27½ %	30 %
421. Bird, squirrel and rat cages, of wire, and metal parts thereof	22½ %	30 %	35 %
422. Trawls, trawling spoons, fly hooks, sinkers, swivels, sportsmen's fishing bait and fishing hooks, n.o.p.	22½ %	30 %	35 %
423. Skates of all kinds, roller or other, and parts thereof	22½ %	32½ %	35 %
424. Guns, rifles, including air guns and air rifles not being toys; muskets, cannons, pistols, revolvers, or other firearms; cartridge cases, cartridges, primers, percussion caps, wads, or other ammunition, n.o.p.; bayonets, swords, fencing foils and masks; gun or pistol covers or cases, game bags, loading tools and cartridge belts of any material	20 %	27½ %	30 %
425. Knife blades or blanks, and table forks of iron or steel, in the rough, not handled, filed, ground or otherwise manufactured	5 %	7½ %	10 %
426. Knives and forks and all other cutlery, of steel, plated or not, n.o.p.	20 %	27½ %	30 %

427. Agate, granite or enameled iron or steel ware	22½ %	32½ %	35 %
428. Iron or steel hollowware, plain black, tinned or coated, n.o.p.; and nickel and aluminum kitchen or household hollowware; n.o.p.	20 %	27½ %	30 %
429. Machine card clothing	17½ %	22½ %	25 %
430. Patterns of brass, iron, steel or other metal, not being models	20 %	27½ %	30 %
431. Plates engraved on wood, steel, or other metal and transfers taken from the same; engravers' plates of steel or other metal, polished, for engraving thereon	15 %	17½ %	20 %
432. Stereotypes, electrotypes and celluloids, for almanacs, calenders, illustrated pamphlets, newspapers or other advertisements, n.o.p., and matrices or copper shells for such stereotypes, electrotypes and celluloids, per square inch	1c.	1¼c.	1¼c.
433. Stereotypes, electrotypes, celluloids, and bases for the same, composed wholly or in part of metal or celluloid, n.o.p., and matrices or copper shells for such stereotypes, electrotypes and celluloids, per square inch	⅛c.	⅛c.	⅛c.
434. Lamp springs	7½ %	10 %	10 %
435. Lamps, sidelights and headlights, lanterns, chandeliers, gas, coal oil or other lighting fixtures, including electric light fixtures, or metal parts thereof; lava or other tips, burners, collars, galleries, shades and shade holders	20 %	27½ %	30 %
436. Gas meters, and finished parts thereof	22½ %	30 %	35 %
437. Safes, doors for safes and vaults, scales, balances, weighing beams and strength testing machines of all kinds	20 %	27½ %	30 %
438. Locomotives and motor cars, for railroads and tramways, n.o.p.	22½ %	30 %	35 %
439. Fire engines and fire extenguishing machines, including sprinklers for fire protection	22½ %	30 %	35 %
440. Sewing machines, and parts thereof	20 %	27½ %	30 %
441. Typecasting and typesetting machines, adapted for use in printing offices, and typewriters	12½ %	17½ %	20 %
442 Printing presses, lithographic presses and type making accessories therefor; also printers' and bookbinders' folding machines, bookbinders' bookbinding, ruling, embossing and paper cutting machines, and iron or steel parts thereof, n.o.p.	5 %	10 %	10 %
445. Mowing machines, harvesters, self binding or without binders, binder attachments, reapers	12½ %	17½ %	17½ %
446. Cultivators, ploughs, harrows, horse rakes, seed drills, manure spreaders, weeders and windmills	12½ %	17½ %	20 %
447. Threshing machine outfit, when consisting of traction or portable engine and separator	15 %	17½ %	20 %
448. Hay loaders, potato diggers, horsepowers, separators, n.o.p., windstackers, fodder or feed cutters, grain crushers, fanning mills, hay tedders, farm, road or field rollers, post hole diggers, snaths and other agricultural implements, n.o.p.	15 %	22½ %	25 %
449. Axes, scythes, sickles or reaping hooks, hay or straw knives, edging knives, hoes, rakes, n.o.p., and pronged forks	15 %	20 %	22½ %
450. Shovels and spades, iron or steel, n.o.p.; shovel and spade blanks, and iron or steel cut to shape for the same, and lawn mowers	20 %	30 %	32½ %
451. Stoves of all kinds, for coal, wood, oil, spirits or gas	15 %	22½ %	25 %
452. Belt pulleys of all kinds for power transmission	15 %	25 %	27½ %
453. Telephone and telegraph instruments, electric and galvanic batteries, electric motors, dynamos, generators, sockets, insulators of all kinds, electric apparatus, n.o.p.; boilers, n.o.p.; and all machinery composed wholly or in part of iron or steel, n.o.p.; and integral parts of all machinery specified in this item	15 %	25 %	27½ %
454. Manufactures, articles or wares of iron or steel or of which iron and steel (or either) are the component materials of chief value, n.o.p.	20 %	27½ %	30 %
456. Ingot molds, glass molds of metal.	5 %	7½ %	10 %
468. Machinery, of a class or kind not made in Canada, specially adapted for carding, spinning, weaving or knitting purposes, when imported by manufacturers for such purposes	10 %	10 %	10 %
491. Steel balls, adapted for use on bearings of machinery and vehicles	Free.	7½ %	10 %
492. Steel wool	5 %	7½ %	10 %

Free.

329. Ores of metals, of all kinds.
330. Antimony, or regulus of, not ground, pulverized or otherwise manufactured.
335. Manganese, oxide of.
343. Tin, in blocks, pigs, bars, plates or sheets; tin strip waste and tin foil.
345. Zinc dust; zinc spelter and zinc in blocks, pigs, bars, rods, sheets and plates; and seamless drawn tubing of zinc.
347. Yellow metal, in bolts, bars and sheets, adapted for use in the construction or repairs of vessels.
348. Brass and copper, old and scrap, or in blocks, ingots or pigs; copper and bronze in bars and rods, in coil or otherwise, not less than 6 ft. in length, unmanufactured; copper in strips, sheets or plates, not polished, planished or coated; brass or copper tubing, in lengths of not less than 6 ft., and not polished, bent or otherwise manufactured.
353. Aluminum ingots, blocks, bars, rods, strips, sheets or plates; aluminum tubing, in lengths of not less than 6 ft., not polished, bent or otherwise manufactured.
355. Britannia metal in pigs, blocks or bars; nickel, nickel silver and German silver, in ingots, blocks or bars, n.o.p.
363. Platinum wire and platinum in bars, strips, sheets or plates.
369. Chronometers and compasses for ships.
370. Rollers, copper, adapted for use in calico printing.
372. Blast furnace slag.
373. Scrap iron a nd scrap steel, old and fit only to be remanufactured, being part of or recovered from any vessel wrecked in waters subject to the jurisdiction of Canada.
443. Newspaper printing presses, of not less value by retail than $1500 each, of a class or kind not made in Canada.
444. Mold boards or shares, or plow plates, land sides, and other plates for agricultural implements, when cut to shape from rolled plates of steel, but not molded, punched, polished or otherwise manufactured.
455. Anchors for vessels.
458. Locomotive and car wheel tires of steel, in the rough.
459. Steel bowls for cream separators, and cream separators.
460. Sundry articles of metal as follows, when for use exclusively in mining or metallurgical operations, *viz.*, diamond drills, not including the motive power; coal cutting machines except percussion coal cutters; coal heading machines; coal augers; rotary coal drills; core drills; miners' safety lamps and parts thereof, also accessories for cleaning, filling and testing such lamps; electric or magnetic machines for separating or concentrating iron ores; blast furnaces for the smelting of copper and nickel; converting apparatus for metallurgical processes in iron or copper; copper plates, plated or not; machinery for extraction of precious metals by the chlorination or cyanide processes; amalgam safes; automatic ore samplers; automatic feeders; retorts; mercury pumps; pyrometers; bullion furnaces; amalgam cleaners; blast furnace blowing engines; wrought iron tubing, butt or lap welded, threaded or coupled or not, over 4 in. in diameter; and integral parts of all machinery mentioned in this item.
461. Machinery and appliances of iron or steel, of a class or kind not made in Canada, and elevators and machinery of floating dredges, when for use exclusively in alluvial gold mining.
462. Blast furnace slag trucks, of a class or kind not made in Canada.
462a. Briquette making machines.
463. Machinery of every kind and structural iron and steel, when imported under regulations prescribed by the Minister of Customs, for use in the construction and equipment of factories for the manufacture of sugar from beet root.
464. The following articles and materials, under regulations prescribed by the Minister of Customs, *viz.*:
(*a.*) All tools and machinery not manufactured in Canada up to the required standard, necessary for any factory to be established in Canada for the manufacture of rifles for the Government of Canada.
(*b.*) All materials or parts in the rough, unfinished, and screws, nuts, bands and springs, to be used in rifles to be manufactured at any such factory for the Government of Canada.
465. The following articles and materials when imported by manufacturers of automatic gas buoys ad automatic gas beacons, for use in the manufacture of such buoys and beacons for the Government of Canada or for export, under regulations prescribed by the Minister of Customs, *viz.*: iron or steel tubes over 16 in. in diameter; flanged and dished steel heads made from boiler plate, over 5 ft. in diameter; hardened steel balls, not less than 3 in. in diameter; acetylene gas lanterns and parts thereof.
467. Machinery, of a class or kind not made in Canada, for the manufacture of twine, cordage, or linen, or for the preparation of flax fiber.
469. Well drilling machinery and apparatus for boring and drilling for water.
470. Iron or steel masts, or parts thereof, and iron or steel beams, angles, sheets, plates, knees and cable chain, for wooden, iron, steel or composite ships and vessels; and iron, steel or brass manufactures which at the time of their importation are of a class or kind not manufactured in Canada, when imported for use in the construction or equipment of ships or vessels, under regulations prescribed by the Minister of Customs.
471. Rolled round wire rods in the coil, of iron or steel, not over ⅜ in. in diameter, when imported by wire manufacturers for use in making wire in the coil, in their own factories.
472. Materials which enter into the construction and form part of cream separators, when imported by manufacturers of cream separators to be used in their own factories for the manufacture of cream separators.
473. Rolled steel for saws and for straw cutters, not tempered or ground nor further manufactured than cut to shape, without indented edges.
474. Steel springs for the manufacture of surgical trusses, when imported by manufacturers of surgical trusses for use exclusively in the manufacture thereof in their own factories.
475. Crucible sheet steel, 11 to 16 gauge, 2½ to 18 in. wide, for the manufacture of mower and reaper knives, when imported by the manufacturers thereof for use exclusively in the manufacture of such articles in their own factories.
476. Steel of No. 20 gauge and thinner, but not thinner than No. 30 gauge, for the manufacture of corset steels, clock springs and shoe shanks, when imported by manufacturers of such articles for use exclusively in the manufacture of such articles in their own factories.
477. Steel of No. 12 gauge and thinner, but not thinner than No. 30 gauge, for the manufacture of buckle clasps, bed fasts, furniture casters and ice creepers, when imported by manufacturers of such articles, for use exclusively in the manufacture of such articles in their own factories.
478. Steel of Nos. 24 and 17 gauge, in sheets 63 in. long, and from 18 in. to 32 in. wide, when imported by manufacturers of tubular bow sockets for use exclusively in the manufacture of such articles in their own factories.
479. Flat steel wire of No. 16 gauge or thinner, when imported

by the manufacturers of crinoline or corset wire and dress stays, for use exclusively in the manufacture of such articles in their own factories.

480. Steel strip and flat steel wire when imported into Canada by manufacturers of buckthorn and plain strip fencing, for use exclusively in the manufacture of such articles in their own factories; and barbed fencing wire of iron or steel.

481. Steel wire, Bessemer soft drawn spring, of Nos. 10, 12 and 13 gauge, respectively, and homo steel spring wire of Nos. 11 and 12 gauge, respectively, when imported by manufacturers of wire mattresses, to be used exclusively in the manufacture of such articles in their own factories.

482. Wire, of brass, zinc, iron or steel, screwed or twisted, or flattened or corrugated, for use in connection with nailing machines for the manufacture of boots and shoes, when imported by manufacturers of boots and shoes, to be used exclusively for such purposes in their own factories.

484. Cups, brass, being rough blanks, for the manufacture of paper shells or cartridges, when imported by manufacturers of brass and paper shells and cartridges, for use exclusively in the manufacture of such articles in their own factories.

485. Brass caps, adapted for use in the manufacture of electric batteries.

486. Iron tubing, lacquered or brass covered, not over 2 in. in diameter, and brass trimmings, when imported by manufacturers of iron or brass bedsteads, for use exclusively in the manufacture of such articles in their own factories.

487. Tagging metal, plain, japanned or coated, in coils, not over 1½ in. in width, when imported by manufacturers of shoe and corset laces, for use exclusively in the manufacture of such articles in their own factories.

The Paragon High Duty Cold Sawing Machine.

The High Duty Saw & Tool Company, Eddystone, Pa., has brought out a new application of its system of high duty sawing under the Tindel patents. Sawing as done with the Tindel blades is really a milling operation. The inserted cutters in the saw blades cut the kerf into chips. The operation is entirely unlike the old method of sawing with a solid tooth saw, which was more of a scraping than a cutting operation. It is essential with the severe feeds and coarse cuts of these saws that the work be held firmly. Indeed, it is necessary that the work be as firm as the machine. Both work and machine should be immovable. Any vibration or chattering of either is fatal to rapid work and destructive to cutters.

To secure rigidity in the work the combined vise and table, shown herewith, has been devised. It will be seen from the general illustration of the Paragon saw, Fig. 1, that a screw adjustable platen is mounted on the bed of the machine. Along the top of this runs a square slot. On this is placed the fixture shown in Fig. 2. A tongue in the fixture corresponds with the slot in the platen. The fixture is mounted on the platen, tongue to groove, and held firmly with bolts as shown in Fig. 2. It will be seen that the fixture is a combination of vise and table. The upper part of the fixture has a block moving by means of a screw in a V way. When the block is brought in contact with the front part of the fixture a solid table is

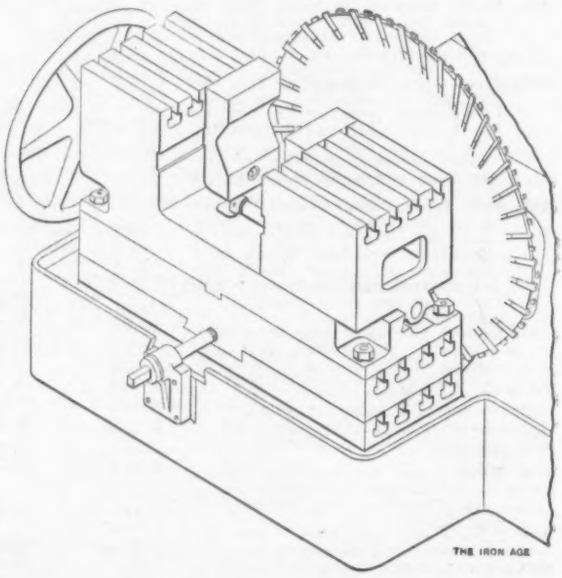


Fig. 2.—The Combined Vise and Table Mounted on Platen.

provided on which work can be mounted in the usual manner by straps and bolts for undercutting. When the block is moved backward special jaws can be inserted in the faces of the block and table for holding bar stock or straight work. By means of a screw the block is brought firmly up against the work, viselike, and a firm, unyielding hold on the work is secured. The screw adjustment of the vise permits the holding of a large variety of work, while at the same time the vise when closed affords a table of unusual facilities for irregular shapes and for undercutting. On the top of the combined vise and table T slots are run for the convenient adjustment of any special holding down clamps.

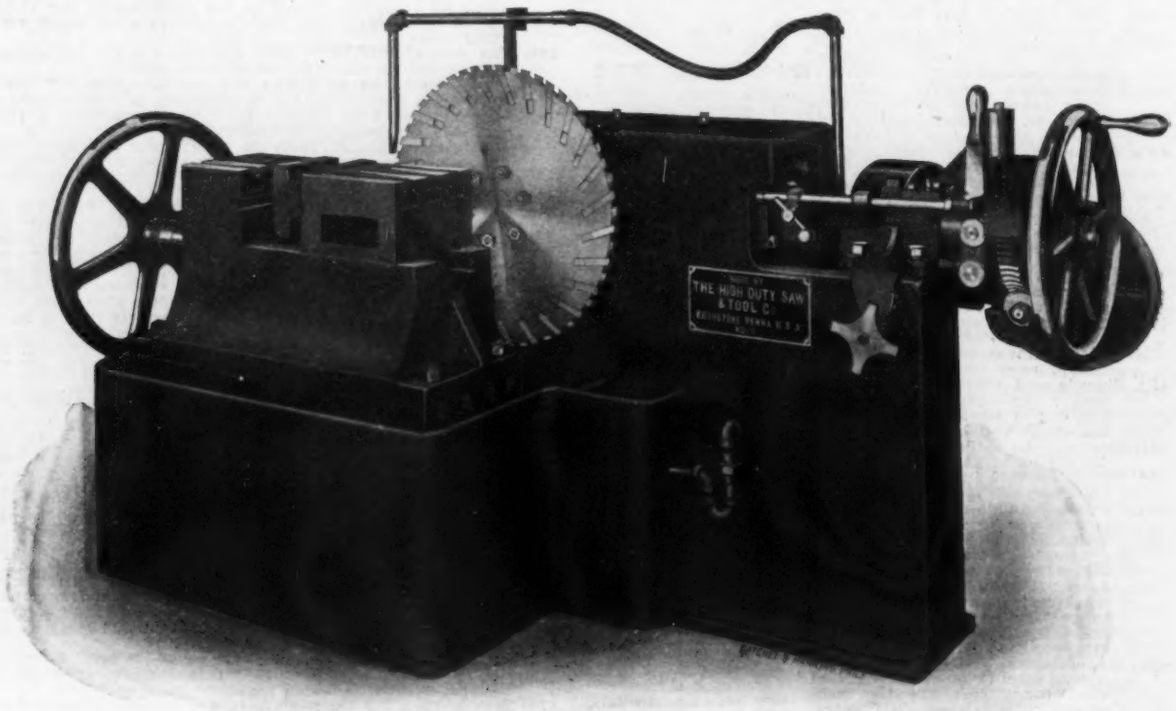


Fig. 1.—The Paragon High Duty Cold Sawing Machine, with Platen Mounted on the Bed.

Canada's Purchases of Iron and Steel Goods in the United States.

TORONTO, November 30, 1906.—Following is a statement of imports in the past fiscal year of United States articles in which readers of *The Iron Age* are concerned. Imports of like articles from other countries are not given, mainly for the reason that they do not amount to much. It may be noted that in many lines the United States trade here has fallen off from the volume reached in previous years. A remark of general application is that the decline has been more in finished products, while the gain has been in semimanufactured articles. The rate of duty is given in each case, and the nondutiable goods are separated from the dutiable.

DUTIABLE GOODS IMPORTED FROM UNITED STATES.

	Duty.	Value.
Cultivators	20 p. c.	$26,257
Drills	20 p. c.	117,233
Field rollers	25 p. c.	204
Forks	20 p. c.	5,105
Harrows	20 p. c.	66,150
Harvesters	20 p. c.	95,846
Hay loaders	25 p. c.	26,435
Hay tedders	25 p. c.	34,076
Hoes	25 p. c.	743
Horse rakes	20 p. c.	21,587
Straw knives	25 p. c.	53
Lawn mowers	35 p. c.	13,296
Manure spreaders	20 p. c.	108,054
Mowing machines	20 p. c.	24,692
Plows	20 p. c.	477,612
Post hole diggers	25 p. c.	1,326
Potato diggers	25 p. c.	6,604
Rakes	25 p. c.	1,819
Reapers	20 p. c.	13,872
Scythes	25 p. c.	7,582
Spades and shovels	35 p. c.	22,683
Parts of agricultural implements	20 p. c.	465,148
All other agricultural implements	25 p. c.	37,793
Anvils and vises	30 p. c.	29,626
Wagon skeins	30 p. c.	9,040
Springs, axles, &c.	35 p. c.	109,820
Bar iron or steel	$7.00 per ton	1,004,270
Butts and hinges	30 p. c.	91,585
Castings in the rough	25 p. c.	368,840
Canada plates, &c.	5 p. c.	126,457
Cast iron pipe	$8.00 per ton	91,023
Cast scrap iron	$2.50 per ton	33,595
Chains	5 p. c.	95,046
Chain for binders	20 p. c.	43,988
Other chains	30 p. c.	76,963
Shoe tacks	35 p. c.	2,435
Cut tacks	35 p. c.	4,782
Railroad locomotives	35 p. c.	338,099
Fire engines	35 p. c.	4,150
Fire extinguishing machines	35 p. c.	53,267
Gasoline engines	25 p. c.	404,104
Steam engines	25 p. c.	460,564
Steel pipe fittings	30 p. c.	381,312
Ferrosilicon and spiegeleisen, &c.	5 p. c.	84,389
Iron and steel forgings	30 p. c.	165,309
Builders' hardware	30 p. c.	665,775
Horseshoes	30 p. c.	14,125
Steel ingots, blooms, billets, &c.	$2.00 per ton	387,142
Steel bridges	35 p. c.	500,475
Pig iron	$2.50 per ton	946,922
Locks	30 p. c.	273,491
Automobiles	25 p. c.	450,777
Fanning mills	25 p. c.	3,144
Wind mills	25 p. c.	41,934
Mining machinery	25 p. c.	151,113
Feed cutters	25 p. c.	558
Horse powers	25 p. c.	556
Portable engines	25 p. c.	717,785
Portable sawmills	25 p. c.	31,382
Threshers and separators	25 p. c.	359,986
All other portable machines	25 p. c.	101,362
Parts of portable machines	25 p. c.	142,124
Sewing machines and parts	30 p. c.	269,214
Slot machines	25 p. c.	41,603
Typewriting machines	25 p. c.	282,897
Other machinery of iron or steel	25 p. c.	4,864,559
Malleable castings	25 p. c.	16,819
Wrought nails and spikes	30 p. c.	123,951
Cut nails and spikes	½ p. c. per lb.	38,559
Wire nails	3-5 p. c. per lb.	18,289
Mold boards and shares	5 p. c.	182,853
Pumps	25 p. c.	246,653
Steel rails	$7.00 per ton	548,822
Fish plates and tie plates	$8.00 per ton	144,243
Structural forms, not punched	10 p. c.	863,936
Rolled iron or steel hoops, bands, &c., 8 in. or less wide, No. 18 gauge and thicker	$7.00 per ton	78,627
Rolled iron or steel hoops, bands, &c., thinner than No. 18 gauge	5 p. c.	89,600
Structural forms, punched, &c., less than 35 lb. per yard, not punched, &c.	$7.00 per ton	301,945
Rolled iron or steel plates or sheets, sheared or unsheared	$7.00 per ton	218,245
Plates, not less than 30 in. wide and not less than ¼ in. thick	10 p. c.	754,732
Rolled iron or steel sheets, No. 17 gauge or thinner	5 p. c.	292,374
Rolls of chilled iron or steel	30 p. c.	32,882
Sad irons	25 p. c.	16,024
Safes, safe doors, &c.	30 p. c.	113,972
Wood screws	35 p. c.	28,436
Weighing scales	30 p. c.	128,939
Galvanized iron or steel sheets	5 p. c.	479,797
Corrugated galvanized sheets	25 p. c.	5,848
Corrugated sheets, not galvanized	30 p. c.	1,411
Skates	35 p. c.	12,872
Skelp iron or steel for wrought pipes	5 p. c.	869,752
Stoves	25 p. c.	467,534
Swedish steel for horseshoe nails	15 p. c.	15,686
Switches, frogs, &c.	30 p. c.	52,650
Boiler tubes	5 p. c.	360,105
Rolled steel seamless tubes	10 p. c.	4,154
Bicycle tubes	10 p. c.	9,730
Tubing, over 2 in. in diameter	15 p. c.	548,071
Tubing, 2 in. or less in diameter	35 p. c.	89,693
Other iron or steel tubes	30 p. c.	54,653
Agate or granite ware	35 p. c.	23,783
Other enameled ware	30 p. c.	152,863
Wire bale ties	30 p. c.	4,932
Wire cloth	30 p. c.	18,726
Wire screens	30 p. c.	3,760
Wire fencing	15 p. c.	70,070
Covered wire	30 p. c.	318,090
Wire of all other kinds	20 p. c.	160,334
Wire rope	25 p. c.	57,692
Iron or steel nuts, &c.	¾c. per lb. and 25 p. c.	112,347
Wrought iron or steel scrap	$1.00 per ton	129,816
Pocket knives	30 p. c.	1,453
Table cutlery	30 p. c.	25,211
All other cutlery	30 p. c.	118,434
Guns of all kinds	30 p. c.	323,269
Needles	30 p. c.	34,840
Chrome steel	15 p. c.	24,614
Steel plates for bridges	10 p. c.	344,403
Steel bars of greater value than 2½c. per lb.	5 p. c.	560,863
Adzes, cleavers, hatchets, picks, &c.	30 p. c.	78,349
Axes	25 p. c.	35,123
Saws	30 p. c.	201,705
Files and rasps	30 p. c.	74,663
Other tools	30 p. c.	903,660
Unenumerated dutiable articles of iron or steel	30 p. c.	2,719,859
Babbit metal	10 p. c.	40,378
Buckles of metal	30 p. c.	26,983
Light fixtures	30 p. c.	319,779
Gas burners	30 p. c.	39,400
Gas meters	35 p. c.	34,055
Lamps, &c.	30 p. c.	326,181
Nickel plated ware	30 p. c.	137,464
Pins	30 p. c.	30,556
Dry white lead	30 p. c.	59,353
Printing machinery	10 p. c.	326,161
Coal, bituminous	53 c. per ton	8,316,150
Coal, dust...20 p. c., but not more than	13c. per ton	487,461
Clocks	25 p. c.	273,919
Clothes wringers	35 p. c.	19,461
Copper nails, &c.	30 p. c.	2,945
Copper wire	15 p. c.	39,393
Other manufactures of copper	30 p. c.	84,441
Electric apparatus	25 p. c.	2,367,497
Electric motors	25 p. c.	981,097
Emery wheels	25 p. c.	41,626
Scrap and pig lead	15 p. c.	273
Lead in bars, &c.	25 p. c.	7,882
Lead pipe	25 p. c.	61,779
Other manufactures of lead	30 p. c.	31,563

FREE GOODS.

Wire rods	$380,489
Bedstead tubes	154,186
Vessel beams, sheets, &c.	250,711
Locomotive and car wheels in the rough	32,580
Mining machinery not made in Canada	827,658
Alluvial gold mining appliances	65,322
Linen making machinery	1,160
Brass goods machinery	4,983
Well digging apparatus	101,006
Charcoal making machinery	39,836
Rifle making tools and machinery	12,559
Parts, &c., of rifles	38,314
Beet sugar machinery	7,043
Umbrella ribs	75,851
Sewing machine attachments	48,138
Shaped steel for saws and straw cutters	129,058
Crucible steel for reaper knives	32,550
Crinoline steel wire	20,426

Skate steel	7,837
Lock steel	5,452
Steel for augers, files and other tools	157,989
Carriage steel, billets and axle bars	112,988
Railway spring steel	119,931
Anthracite coal	10,141,350
Binder twine	1,628,923
Articles for manufacture of twine	61,859
Coke	1,280,064
Diamond drills	40,620
Brass scrap and blocks	238,697
Brass in bolts, bars, &c	181,548
Brass in strips, &c	189,968
Brass tubing	128,529
Scrap copper	61,904
Copper in pigs	375,959
Copper in bolts, bars, &c	1,919,754
Copper in strips, &c	507,576
Copper tubing	55,137
Cream separators	407,073
Articles for cream separators	93,025
Spelter	181,674
Tin in blocks, &c	598,760
Tin plates and sheets	733,167
Tin foil	56,698
Barbed fencing wire	918,598
Crucible cast steel wire	15,541
Nailing machine wire	130,800
Galvanized wire, 9, 12 and 13	1,017,489
Wire rigging for ships	2,286
Zinc in blocks, &c	37,571
Printing presses	398,187
Surgical and dental instruments	161,382

C. A. C. J.

The Amsterdam International Exposition.

The Netherland Chamber of Commerce in America, 68 Broad street, New York, calls attention to the fact that "an international exhibition of motors and machines for professions and trades" will be held at Amsterdam, Holland, in the Palace of Industry, during the months of August and September, 1907. The exposition will be conducted by the Maatschappij Van Nijverheid (the Industrial Institute of Holland), which was founded in 1777. A circular issued by this institution states that "it is now being felt more and more keenly in Holland how necessary it is to prove to the craftsman the great advantage there is for him in the use of small motors and machine tools in his trade. As gas, benzine, and other small motors are now being brought to such a state of perfection and in many places central electrical installations are being erected, the craftsman will be able to procure cheap machine installations, without which small trade can no longer compete. Up to the present, however, the Dutch craftsman has not been given the opportunity to see this advantage from practice. For this reason an exhibition has been projected exclusively for the craftsman, where the most modern motors and machine tools used in his trade may be seen." The idea has met with general approval, the Dutch Government having made an appropriation therefor in the budget for 1907, while the province of North Holland and the municipality of Amsterdam have already granted financial support. The secretary-general, to whom all correspondence should be addressed, is Dr. Th. Müller Massis, Heerengracht 357, Amsterdam, Holland.

Shell and Gun Forging Bids.—Bids were opened at the office of the chief of ordnance of the army, Washington, D. C., November 30, for furnishing 100 10-in. armor piercing shell, 300 12-in. armor piercing shell and 100 12-inch armor piercing shot. The following bids were received:

Firth Stirling Steel Company, Washington, 10-in. shells, $300 each.

Midvale Steel Company, 10-in. shell, $199 each, delivery in five months; 12-in. shell, $358 each, delivery in 13½ months, and 12-in. shot, $397 each, delivery in two months.

Bethlehem Steel Company, 10-in. shell, $206.50 each, delivery in 180 days; 12-in. shell, $345 each, delivery in 365 days, and 12-in. shot, $408 each, delivery in 245 days.

Bids were also opened for sets of forgings for 3-in. rapid fire guns, the bidders being as follows: Bethlehem Steel Company, 40 cents per lb.; Midvale Steel Company, 40 cents per lb.

The Disposal of Acid-Iron Wastes.

WASHINGTON, D. C., December 4, 1906.—An investigation of stream pollution caused by the acid-iron wastes from large iron works was recently completed by the United States Geological Survey, and a report thereon has been prepared by Herman Stabler, of which an abstract is here presented:

A Serious Problem.

Stream pollution by iron works' effluents has always been an important question in countries where the iron industries are prominent. The polluting liquors, commonly known as "acid-iron" liquors, are derived from the "pickling process" common to galvanizing, tin plating, tube and sheet iron treatment, and in fact all work in which a clean iron surface for coating or other purpose is required. The clean surface is obtained by immersing the material in a fairly strong solution of hydrochloric or sulphuric acid, which readily removes the surface impurities and at the same time attacks the material itself, dissolving it or uniting with it to form new compounds. As a result of the process the material treated comes from the bath with a surface as clean and bright as if newly polished. By continued use the acid solution becomes gradually weaker, iron chlorides or sulphates being formed, and the whole bath becomes more or less impregnated with impurities, chief among which are practically insoluble iron oxides. Finally the solution becomes too weak for further profitable use and is discarded as waste, technically known as "waste pickle." This waste pickle, used in small quantities, is beneficial to both animal and vegetable life. It is not a desirable addition to streams, however, because (1) it produces a reddish discoloration and turbidity, making the stream waters, bed and banks unsightly; (2) by reason of its avidity for oxygen it robs the waters of their natural supply of this essential gas and thereby, when it is present in comparatively large quantities, causes the death of fish, and (3) it adds a large quantity of iron to the stream and thereby impairs the usefulness of the water for domestic and laundry purposes and for certain manufacturing processes.

In many cities waste pickle is discharged into the sewers. Where the quantity of pickle is relatively very small this method of disposal is not objectionable. Too frequently, however, there is enough free acid in the waste liquors to corrode the sewer joints and metal fittings, and in case there are sewage purification plants to interfere seriously with the working of the purification processes.

At Shelby, Ohio, acid-iron wastes have been discharged into a water course and also into the sewers of the town, causing conditions which have led to lawsuits and complaints directed to the Ohio State Board of Health. It was determined, therefore, to investigate at this city the factory processes which are accountable for the alleged nuisance and the conditions at the sewage disposal farm and along the stream. As the result of this inquiry it has been determined that it is possible to completely obviate the nuisance complained of by the installation of a device for recovering copperas from the waste pickle.

Copperas Plant at Shelby.

With the twofold idea of preventing the discharge of the liquor into the stream and, if possible, of adding to the economy of pickling operations, a plant for the recovery of copperas from spent pickle was installed at the works of the Shelby Steel Tube Company. This plant is simple in construction and operation. The spent pickle is drained by gravity into a lead lined wooden receiving or storage tank of rectangular cross section, having a capacity of about 6000 gallons—sufficient to accommodate the spent pickle from four days' work. From the storage tank the liquor is drawn by charges into an evaporator for concentration. The evaporator is a wooden tub of rectangular plan and trapezoidal elevation having a capacity of a little more than 2000 gallons. The tub is lined with ⅛ in. lead and heated by a steam coil. It is provided with a wooden hood and a draft for carrying off the vapor.

A much more economical evaporator, though more expensive in first cost, could be used.

Iron or steel turnings are introduced into the evaporator to neutralize the free acid and to reduce ferric to ferrous sulphate. The liquor is concentrated to about 45 degrees Baume (sp. gr. 1.453; Twaddell, 90.6 degrees) and then drawn off into wooden crystallization tubs. These tubs are rectangular in cross section, and have a capacity of about 675 gal. each. To assist in the crystallization, and to provide a support for the crystals, wooden strips are hung in the tubs. The dependent crystals are gathered, drained, and barreled for shipping. The mother liquor, together with the more impure crystalline copperas from the sides and bottom of the tubs, is pumped back by hand to the storage tank or the evaporator. Occasionally such matter is discharged into the stream with wash water from the tubs to dispose of accumulated impurities.

In the original plant three crystallization tubs were used, but three more were added in the summer of 1905, making six in all.

Analyses of Crystals.

Analysis of the crystals produced gave the following results in per cent.: Acidity as H_2SO_4,0.2; sulphuric acid as SO_3, 27.5; iron as Fe, 18.9. This approximates the formula $FeSO_4 7H_2O$ for ferrous sulphate crystals, but indicates the presence of small amounts of ferric sulphate and free acid.

Average figures for several months show that the copperas produced is, by weight, 50 per cent. of the acid used in pickling. For the 6350 lb. of acid used per day, therefore, a product of 3175 lb. of copperas would be obtained, having a content of 875 lb. SO_3. This is 21.7 per cent. of the SO_3 in the acid used for pickling, or 71.1 per cent. of the SO_3 in the spent pickle.

There is, therefore, a loss—presumably taking place by leakage in the evaporator, storage tank, and crystallization tubs—of 8.8 per cent. of the active principle of the acid used for pickling, or 28.9 per cent of the amount of such principle present in the spent pickle.

The estimated disposal of the SO_3, assuming an average daily use of 5000 lb. of acid, may be summed up as follows:

	Per cent.	Pounds per day. Acid.	SO_3	Value as 60° acid.
Loss in rinse water	3.7	185	144	$1.34
Loss in pickling tubs	65.8	3,290	2,566	23.80
Loss in copperas plant	8.8	440	343	3.18
Recovered in copperas	21.7	1,085	847	7.85
Totals	100.0	5,000	3,900	$36.17

Cost of Recovery.

Original estimates on cost of recovery per ton of product were as follows:

Coal, at $2.25 per ton	$1.08
Iron turnings, at $13 per ton	.89
Barrels, &c., for shipping	1.90
Total	$3.87

It is thought that $2 will more nearly approximate the actual cost of fuel for evaporation with the evaporator used, although, owing to the complication of heating arrangements, no exact figures are obtainable.

Accepting the other items as correct and adding $1 per ton for labor and 50 cents per ton as a 10 per cent. annual depreciation upon a plant valued at $2000, we have, for the production of 1 ton of copperas, the following figures:

Average value of copperas (twelfth U. S. Census)		$9.64
Fuel, at $2.25 per ton	$2.00	
Iron Turnings, at $13 per ton	.89	
Miscellaneous supplies	1.90	
Depreciation	.50	
Labor	1.00	
		6.29
Profit		$3.35

This is a liberal estimate of costs, and will, without doubt, be sufficient to more than cover the actual conditions at Shelby. Were the plant arranged to save the liquor now lost and a better evaporator used, a much better showing could be made. It must be considered that the advantageous arrangement of the plant for gravity flow contributes in some measure to the lost cost of the product. Were pumping required, the cost would not in any case be more than $6.64 per ton, leaving $3 per ton as a low estimate of profit under extremely adverse conditions.

With a capital of $2500 and a yearly product of 400 tons of copperas, the foregoing figures would show an annual profit of $1350, or 53.6 per cent. upon the capital invested. The margin of profit, with the present price of copperas, is large enough to permit the application of the method to any plant of size sufficient to create a nuisance by stream pollution.

Other Disposal Processes.

Several other processes for the disposal of sulphuric acid pickle have been tried experimentally, and a few have been applied on a commercial scale. The most prominent of these and their results are tabulated below:

Process.	Result.
Electrolytic regeneration of acid	Expensive.
Recovery of basic ferric sulphate and acid by aeration	Expensive.
Recovery of "sugar copperas"	Practicable.
Chemical precipitation	Expensive.

So far as known, recovery of copperas in large crystals and as "sugar copperas" are the only processes that will pay for the cost of disposal of the spent pickle from sulphuric acid.

For spent pickle from hydrochloric acid containing iron chlorides a cycle of regeneration has been perfected in England by Thomas Turner. In brief, the pickle is fed into a reverberating furnace; iron oxide is retained and the hydrochloric acid passes over with the fire products and is condensed in ordinary muriatic towers. The cost of 75 per cent. acid recovered is stated at about $2. In this country it would doubtless be somewhat higher.

W. L. C.

Milliken Structural Sections

Milliken Brothers, Incorporated, 11 Broadway, New York, whose new open hearth steel plant at Milliken, Staten Island, was recently put in operation, have issued a pamphlet of 71 pages in advance of the completion of a handbook now being compiled illustrating the structural sections which will be produced at their mills. The sections in the preliminary pamphlet consist of standard beams ranging in depth from 5 to 24 in.; standard channels from 4 to 18 in.; standard angles of equal lengths, ranging from 2½ to 8 in.; standard angles of unequal lengths, ranging from 2½ x 3½ in. to 6 to 8 in., and standard Z-bars ranging in depth from 3 to 6 in., with varying lengths of legs and thicknesses of web and legs. Details are given also of weights and dimensions of the various shapes, together with tables of safe loads based on a maximum fiber strain of 16,000 lb. per square inch. The rolled sections are the standard structural shapes adopted by the Association of American Steel Manufacturers, with the exception of the 18-in. channel, which is a new section of standard proportions, being the largest channel yet made. The manufacturers bring forward this channel as of special value in the construction of heavily loaded columns and bridge chords where a large radius of gyration is essential to economy of design.

The International Rail Syndicate.—From English sources comes the report that the Cargo Fleet Iron Company, Middlesbrough, has become a member of the International Steel Rail Syndicate. The Cargo Fleet Company completed this summer a thoroughly modern steel plant and mill, and not long since took very large orders for steel rails from some South American railroads.

The General Castings Company, Pittsburgh, has recently built an extension to its plant at Verona, Pa., 40 x 200 ft., which will be used as a chipping and cleaning room. The new 20-ton open hearth furnace is expected to be ready for operation December 15. This company has recently opened a sales office at 42 Broadway, New York, in charge of G. L. L. Davis.

The Rathbone Multiple Molding Machine.

The economies in foundry molding by machine as developed at the present day are brought more emphatically to notice by the perfection of the principle of multiple molding. The development of this particular method has been slow, owing to the opinions against the apparent possibility of pouring castings in a stack of molds without straining. Roughly, the development of this principle has been as follows: First, it occurred to some one to put one mold on top of another, after cutting the sprue hole in the top mold through the drag of that mold, to reach the sprue of the bottom mold as a means of pouring, and it was found that by exercising a certain amount of care in the pouring the castings in the bottom molds were as good as those in the top ones. The expected did not happen—the bottom mold neither burst, ran out nor strained, nor did the bottom of the sprue cut up. This was explained by the fact that the metal in pouring did not fall with its full force directly to the bottom of the pouring hole, but, "wetting" the sides, reached the bottom mold fully as lightly as if it had fallen but one-tenth the distance from the open lip of a hand ladle.

That the bottom mold does not strain is due no doubt to the fact that by the time the metal has filled the next mold above and has risen to the level of the mold above that and filled it, when the head has become sufficient to do some straining, either the gate, due to its small section, or the casting in the lower mold itself, has set sufficiently to prevent the easy access of any more metal; so that as the pressure in the head increases so does also the resistance to its entrance into the lower molds. Still another reason for less straining than is expected in these bottom molds lies in the fact that never were molds so perfectly weighted and held as those at the bottom of a stack of molds in iron flasks. It has been estimated that the pressure on the mold at the bottom of a stack 45 in. high is only about 12 lb. to the square inch, and as the sand in these molds has been rammed 40 lb. to the square inch the impossibility of the mold giving way is obvious.

The experiment of piling one mold on another worked so well that it was thought worth while to utilize all the joints in the stack for molds. In fact, one of the great advantages of multiple molding is that, except for single faced cope and drag at the top and bottom of the pile, respectively, just half the sand and flasks are used that would be the case in ordinary two-part flask molding. To accomplish a mold in every joint—that is, each single part flask with the cope for the mold below and the drag for the mold above, in the single block of sand—involved, it can be seen, ramming the sand up against the drag patterns, for only one filling can be made of a flask of loose sand into which must be rammed simultaneously the cope pattern at the bottom and drag patterns at the top. This necessity of ramming the drag patterns down into the sand, limited, for years, multiple molding to a pattern having very flat drag parts. Some years ago A. K. Beckwith, Dowagiac, Mich., overcame this difficulty by placing his drag patterns in what he called a "receptacle," which he filled with sand upon the drag patterns, locking up, and then by means of a piece of sheet metal held the sand in this "receptacle" and in contact with the drag patterns while he inverted it and placed it over the flask already filled with sand upon the cope patterns on the machine. After withdrawing the sheet of metal from between the two bodies of sand he rammed the drag patterns down into the sand upon the cope patterns. This process made possible for the first time the multiple molding of deep drag work, but necessitated in its operation the rolling over of the drag match or receptacle, &c.

Within the past year J. A. Rathbone, Detroit, Mich., discovered that by attaching the drag patterns to the oscillating ramming yoke of a power machine and giving the flask filled with sand an upward velocity, equal to that of sand falling from a shovel or riddle, he could place his sand up among his drag patterns to very considerable

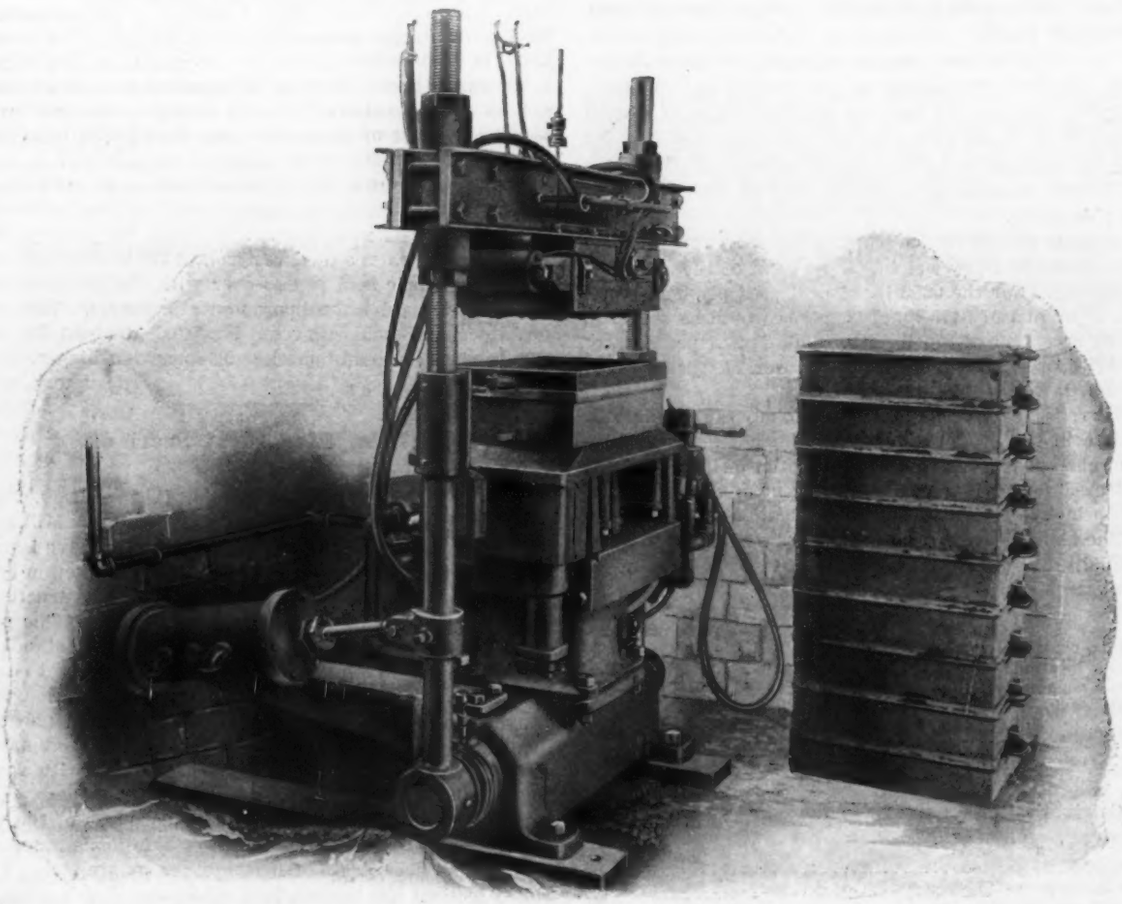


Fig. 1.—The Rathbone Multiple Molding Machine, Built by the E. H. Mumford Company, Philadelphia, Pa.

depths. By this method Mr. Rathbone makes a single filling and a single ramming from a complete mold in an incredibly short time, and 75 14 x 16 or 13 x 18 in. molds have been made by one man in one hour's time, this man shoveling his sand from the heap and carrying off and stacking his own molds.

Several power machines for this class of work, which are now in successful operation, have been designed and are now being placed before the trade by the E. H. Mumford Company, Philadelphia, Pa., designer and builder of foundry molding machines. One of these, shown in the accompanying illustration, Fig. 1, is of the usual power ramming split pattern vibrator type, with special attention given to solidity of construction and truth to center line, with provision for accurately guiding the upper or drag patterns on the ramming block. To facilitate the swing of the ramming yoke a power cylinder (shown at the lower left of the machine) actuated by a small pop valve on the hand rail on the yoke is provided, even in the smallest size machines; whereas, usually power swing ramming yokes are not used in machines under 24 in. square. Both cope and drag patterns are heated with gas from local mains or a portable gasoline torch, and served by vibrators. All bearings are protected from sand and lubricated by closed cups. When this machine is working anywhere nearly at speed, and there are cores to be set, a second man is essential for this core setting, and as this man usually carries off the molds from the machine its product is proportionately increased.

In operation, a flask, faced and pinned at both joints, is placed over the cope patterns on the machine, which are attached to the usual vibrated pattern plate. The ramming yoke of the machine is brought forward and a steel frame or "sand box" is released by two electro-magnets or other retaining device, which holds it so that it drops upon the flask below. Riddled sand is then struck flush with the top edge of the sand frame. The ramming yoke, upon which are the drag patterns, is brought up again into ramming position. Air is admitted through the large throttle valve and the charge of air in a reservoir close to it is suddenly admitted to the cylinder of the machine. As a result of this sudden admission of air the flask, sand and patterns are thrown violently up against the patterns upon the ramming yoke, and the loose sand in the flasks rises among the patterns, filling deep pockets just as though it had been dropped or thrown down upon them. The sand thus placed all round the patterns has no opportunity to fall away from them, for it is caught and squeezed by the accumulating pressure in the cylinder. Thus both the cope and drag molds are rammed simultaneously. The sand frame is made of such a depth that when its upper edge lands upon adjustable stops on the ramming block the joint face of the drag pattern plate is flush with or above the top edge of the flask, and the mold is sufficiently rammed.

On difficult work, requiring hand tucking of the edges of the mold, the sand joint rises above the flask edges, but the result is equally good so far as the joints, &c., are concerned.

The vibrator for the drag patterns is automatically started as the machine rams, and as the flask and sand fall back with the ramming head of the machine the drag patterns are drawn from the sand, while the sand frame is removed by being held by the electro-magnets or other retaining device. The cope patterns and flask pins are now drawn from the bottom side of the flask and the mold is complete, cope and drag, in half a minute. The operator now carries off this first mold and places it, regardless of its bottom or cope face, upon a board or flat, firm bed, not soft sand.

The next mold is made in the same manner, except that the sprue for the mold now formed between the first and second flasks is cut through it automatically by the machine. So one mold after another is made until, determined mainly by convenience in pouring, the topmost one is in position, when a larger pouring basin is shaped upon it and, if thought best, a pouring weight is added. Except for the top mold no weight is needed, as the lower mold joints are made good by the weight of the upper molds upon them. Printing back on these machines consists of a mere matter of shaking facing on the mold from which the patterns have just been drawn and ramming them into the mold again, without the exercise of any skill by the operator, and is done in a few second's time.

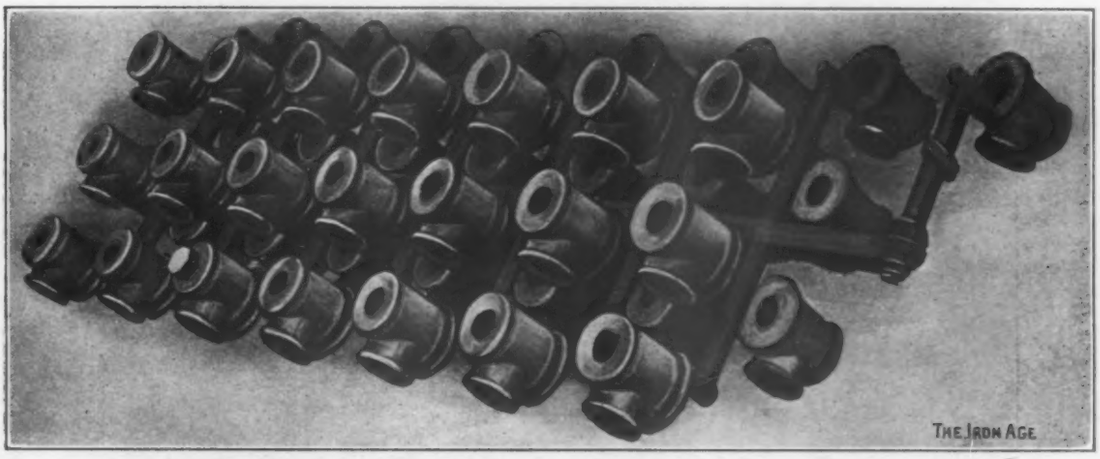


Fig. 2.—A Stack of Castings Made by the Rathbone Multiple Molding Machine.

As has been said, it is generally supposed that the lower molds must be strained by the head of the liquid metal above, but, by a judicious apportioning of the section of the gate to the massiveness of the casting, it may be caused just to feed it without straining it, and, for most of the work for which multiple molding is suitable, it is sufficient that the gate should be thinned down so that it has set by the time the second mold above it has filled, and the head is on the point of being increased by the filling of the sprue above.

The economies of this method of molding are not confined to speed alone. In stacking nine molds for pouring, as in this method, it is evident that nine molds occupy the floor space of but one. The ramming of the cope and drag parts in one flask also results in a saving in the sand used, but, as the flasks for multiple molding average about 15 per cent. deeper than those for ordinary molding, the actual net saving in sand and flasks may not be assumed to be greater than 37 per cent. A stack of castings made by the multiple process is shown in Fig. 2, which are 1 x ¾ x ½ in. gray iron tees, the total number of castings being 72. Castings from opposite ends of the gate in each mold were broken off for comparison in weight, which is shown in ounces in the following table, No. 1 being at the bottom of the stack:

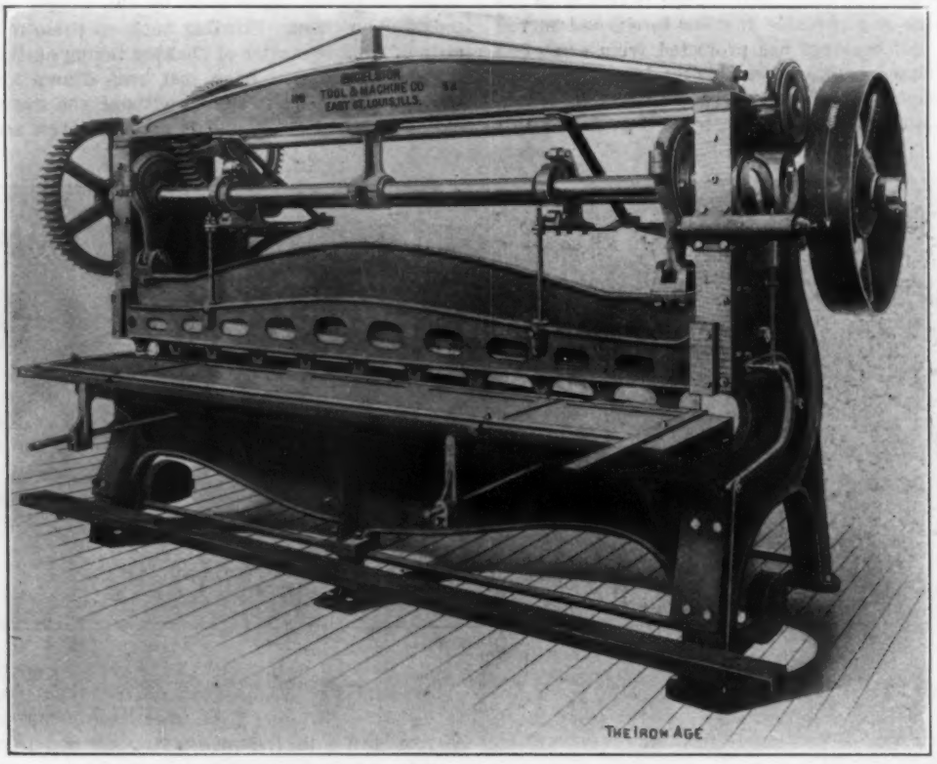
	Vertical row A.	Vertical row B.
8	17¾	18
7	18⅛	18
6	18⅛	18
5	18⅛	18⅛

4	18⅛	18⅛
3	18⅓	18½
2	18¼	18¼
1	18	18

Equally good results are obtained in small steel and malleable castings as well as in brass plumbers' goods. At present the E. H. Mumford Company is making these machines in three sizes, taking in flasks 13 x 18 in., 14 x 16 in. and 16 x 16 in., although larger or special sizes will be built if so desired.

The Excelsior Double Geared Squaring Shear.

The doubled geared power squaring shear shown herewith, manufactured by the Excelsior Tool & Machine Company, East St. Louis, Ill., is designed for trimming, cross-cutting or slitting sheets. It is equipped with an automatic hold down which straightens the sheets and holds them firmly while cutting, releasing at the beginning of the upward stroke, and adjusts itself to the various gauges. The advantage of the overhead gearing arrangement can be readily appreciated, as it allows free use of the only available space for clippings and sheared stock. The clutch is of a friction, double compression type, self-oiling, and can be adjusted by one screw. The graduated table is cast in one piece and is provided with double end gauges and a double set of extension gauges in front, and if desired an adjustable sliding gauge is furnished for rear attachment for slitting strips ½ in. in width. Extension gauges are also provided in the front and rear so that various widths of sheets can be cut without stopping to adjust the gauge for various dimensions. The shears are manufactured in five sizes, namely, 50, 62, 96, 110, and 122 in., and weigh respectively 6500, 7800, 10,000, 14,000, and 16,500 lb.



The Excelsior Double Geared Power Squaring Shear.

A New Bank Sand Screening Plant.—Something out of the ordinary in the shape of a plant for handling bank sand is incorporated in an order received by the Carlin Machinery & Supply Company, Allegheny, Pa., for use near New Castle, Pa. The sand to be handled is intended for furnace use, and it is stipulated that it shall contain the usual amount of loam as it comes from the bank. The total sand and gravel capacity of the plant will be 300 tons daily. Furnace sand will be received, screened and delivered to one storage bin of large capacity. The gravel separated from the sand will be washed and stored in bins to be easily accessible in loading for transportation. In connection with the screening plant is a sand washing plant of 100 tons capacity. The washed sand product will be used for manufacturing lime sand brick for general building purposes.

A Large Water Piping Contract for Gary.

The Best Mfg. Company, Pittsburgh, Pa., founder and pipe fitter and manufacturer of Climax bronze and copper castings, has received a large contract for water piping for the new plant of the Indiana Steel Company at Gary, Ind. This contract includes a high pressure system for supplying water for 12 blast furnaces, with accompanying open hearth furnaces, rail, structural and plate mills. The machinery comprises seven hydraulic pumps, with 24-in. discharge, and from each of which enter a 42-in. cast steel main 200 ft. long. This main has connecting branches, including 3400 ft. of 36-in. lock bar piping, 850 ft. of 30-in., 4100 ft. of 24-in., 500 ft. of 20-in., 100 ft. of 18-in., 700 ft. of 16-in., 310 ft. of 15-in., 200 ft. of 14-in. and 200 ft. of 12-in. These water lines are all fitted with rolled steel flanges, cast steel fittings and a special design of Best patent gate valves, taper seats and adjustable wedge disks. The material will all be fitted at the company's shops in Pittsburgh, and will require 120 cars to transport it to destination, the total amount of the order being about 2500 tons.

In addition to the above, the Best Mfg. Company received recently the complete steam and water piping contract for the new blast furnaces being erected at Mayville, Wis., by the Northwestern Iron Company, and a similar contract for the Josephine Furnace, at Josephine, Indiana County, Pa., being built by Corrigan, McKinney & Co., Cleveland, Ohio, and steam valves and piping for the Procter & Gamble Company's new soap plant to be located at Mariner's Point, Staten Island, N. Y., and which is expected to be the largest and most modernly equipped soap plant in the country. The Best Mfg. Company has one of the largest plants in the country for the manufacture of valves and fittings, and has installed some of the most important power plants in this and foreign countries.

A Tile Furnace Roof for Boilers.*

BY A. BEMENT, CHICAGO.

Under the title, "Boiler and Setting," the paper describes an improved design of boiler equipped with stoker for use with bituminous coal. The objects sought are perfect and smokeless combustion and the full utilization of the boiler heating surface. The first requirement is

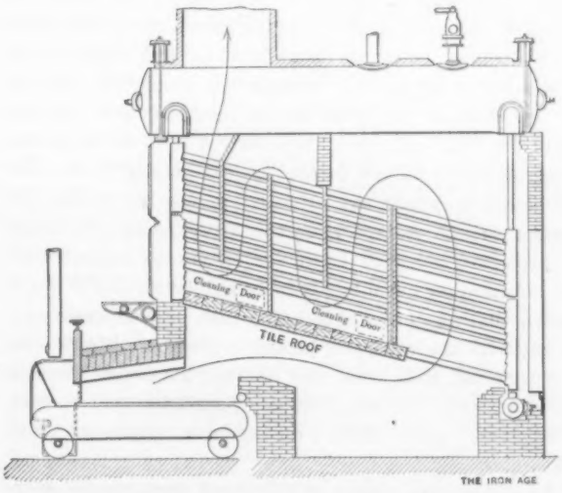


Fig. 1.—Improved Boiler and Setting.

secured by the employment of a tile furnace roof supported by the boiler tubes of the lower row. Fig. 1 shows an elevation and section of a boiler equipped with a chain grate stoker and using the tile roof. The individual refractory tiles used in the formation of this roof are illustrated in detail in Fig. 2 and by vertical cross section in Fig. 3. The tile roof prevents the flow of unburned gases among the tube surfaces of the boiler and causes them to travel a considerable distance before the heating surface is reached. Thus the gases and air become sufficiently mixed to insure complete combustion. The capacity of the tile roof furnace shown is only sufficient to mix properly the air and gases which flow from a chain grate fire; where other forms of stokers are employed it will be necessary to make provision for the same uniformity in feed of coal and condition of fire as

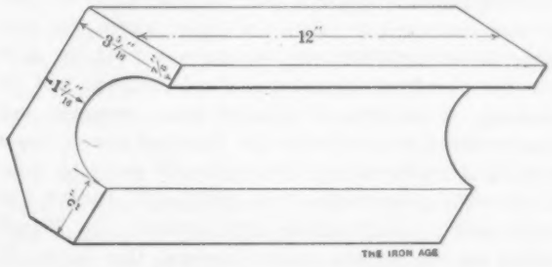


Fig. 2.—Refractory Tile for Furnace Roof.

is secured with chain grates if complete combustion is to be had. To insure the useful employment of all the boiler surface the gases are led over the whole of it by means of passages of less area than are commonly used. A space at the bottom of the boiler above the tile roof equal to that ordinarily required by the second and third tiers of tubes is left vacant for the purpose of accumulating dust. The contracted passages among the tube surfaces produce a high resistance, and therefore a strong draft is required. The author considers that a combination of forced and induced draft secures the best combustion. By manipulating the intensity of the forced and induced draft a balance pressure may be obtained in the furnace chamber when varying amounts of coal are being burned. Therefore this draft system operates not only to overcome the resistance due to the passage among the heating surfaces, but also insures complete combustion with a smaller air space than would be the case with induced draft alone.

The author gives some examples of the performance of water tube boilers fitted with the tile furnace roof, comparing these with the work of similar boilers without the tiles. Photographs are reproduced showing the smokeless stacks of boilers equipped with the tile furnace

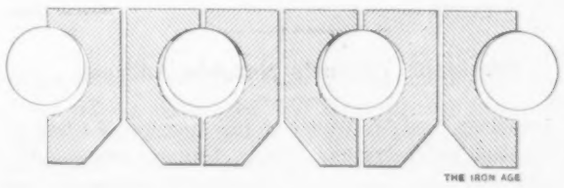


Fig. 3.—Section Showing Furnace Roof.

roof, and in other views are shown chimneys emitting heavy smoke from the furnaces of water tube boilers having chain grates, but without tile roofs.

* Abstract of a paper read December 3 at the New York meeting of the American Society of Mechanical Engineers.

Customs Matters.

Appraisers' Annual Conference.

The annual conference of United States appraisers began in New York on Monday and will continue into next week. Appraisers and other officials from all the leading ports of the country are in attendance. These yearly meetings were instituted by Daniel Manning, Secretary of the Treasury during President Cleveland's first term. The primary object sought in bringing together the officials is the attainment of uniformity in the appraisement and classification of imported merchandise at the different ports. The conferences have been productive of much benefit to the customs service in placing on an equality imports of the same character brought in at ports of the United States widely separated.

The Treasury Department has always encouraged the conferences as an aid in protecting the public revenue, placing all importers on an equal footing, and as protecting the domestic producers of competing goods from undervaluations in the imported merchandise. At the present conference all questions of a perplexing character that have arisen in the administration of customs since the meeting last year will be discussed and a uniform basis reached for the classification or appraisal, as the case may be, of the merchandise. Officials of the Treasury Department state that a gratifying degree of uniformity at the various ports prevails. This result has been achieved, it is stated, owing to the length of time the present tariff law has been in effect without revision, while another potent factor is the Customs Administrative Act, which has made it possible, through the Board of Appraisers and the Federal courts, to decide thousands of knotty points in the Dingley schedules, thus making precedents for future importations. Still another element entering into the situation is the co-operation existing between the customs officers in the United States, the consular representatives abroad and the special agents of the Treasury Department stationed in Europe.

Machine Knives.

It has been decided by the Board of United States General Appraisers that steel knives constituting the conspicuous feature of machines intended and designed for cutting dyewoods into suitable lengths are properly dutiable at the rate of 45 per cent., under the provision in the tariff act for manufactures of metal. The importer, M. F. Roberts, Philadelphia, claimed that the merchandise should be assessed as beveled parts with the lower duty stipulated in paragraph 135. The board approves the classification imposed by the customs authorities, and the protest is accordingly overruled.

THE IRON AGE

1855—1906.

New York, Thursday, December 6, 1906.

DAVID WILLIAMS COMPANY, ... PUBLISHER
CHARLES KIRCHHOFF, ... } EDITORS
GEO. W. COPE, ... }
A. I. FINDLEY, ... }
RICHARD R. WILLIAMS, ... HARDWARE EDITOR

President Taylor's Notable Address.

President Fred W. Taylor of the American Society of Mechanical Engineers has made a brilliant contribution to technical literature in his presidential address. No previous occupant of that or of any similar position has ever presented a work comparable with this. It is monumental in its character, comprising a great volume with numerous plates, representing prodigious industry in its preparation and extorting admiration for the comprehensiveness with which the subject is treated. But, what is of vastly greater importance, the address is a complete exposition of the methods pursued and a revelation of the discoveries made through which high speed has been attained in the operation of metal working machine tools. The creator of this revolution in machine shop practice is Mr. Taylor himself, and in his address, which he entitles "The Art of Cutting Metals," he tells modestly, but most entertainingly, how his investigations began that led to the successful accomplishment of one of the most notable industrial achievements of the past quarter of a century. The place of his initial experiments was the machine shop of the Midvale Steel Company, Philadelphia, of which he became foreman in 1880. The motive was to ascertain what laws or principles governed the cutting of metals, so that he could determine how much machinists should do in a given time. His narrative of this episode shows how wonderfully great developments come through the fortuitous combination of an exigency to be met and a man properly equipped by nature and training to deal with it intelligently. Expecting that the necessary experiments might require six months for a satisfactory conclusion, so much was learned in that time regarding the possibilities of metal cutting appliances that it simply whetted his desire to go further and learn more. The investigations have, therefore, proceeded for 26 years, and have involved the work of a number of other investigators on both sides of the Atlantic.

In this volume Mr. Taylor presents not only the results of his work and of those associated with him, but also what has been done by those who have pursued independent investigations. He shows at the same time that while the work done by others has been of value in the general illumination of this subject, they have fallen far short of comprehending all the requirements necessary to arrive at the exact knowledge of how to run a machine shop, so as to make the information thus gained of direct practical use. In his narrative he states that early in his investigations he found that it would be necessary to determine the important facts or laws connected with the art of cutting metals; to find simple mathematical expressions for such laws; to investigate the limitations and possibilities of metal cutting machines and to develop an instrument, which is the slide rule, to enable a machinist without mathematical training to ascertain quickly in each case the speed and feed of a machine to do the work best and most quickly. It is interesting to note that he lays less stress on the chemical composition of the self-hardening steel of which the cutting tool is made than on the shape of the nose of the tool, its temperature while cutting, the pouring of a heavy stream of water on the chip at the cutting point, the character of the belting used, the thickness of the chip and other mechanical details.

The author pays a high tribute to those who have used his processes. He says that during the whole 26 years he has succeeded in keeping secret almost all of the laws deduced from his investigations and experiments. While never selling any information connected with the art for cash, he has given to one company after another all of the data and conclusions arrived at in exchange for the opportunity of still further continuing the work. The companies to whom the information was given and the mechanics who worked upon the experiments were bound by promises, many of them verbal, not to communicate the information nor allow it to be published, and it is not known that any one of the many men or companies connected with the work has broken a promise. Mr. Taylor may well say, as he does, that he "has his doubts whether any other country can produce a parallel record of such widespread good faith among its engineers and mechanics."

In making the results of this great work public, sparing neither time nor labor in explaining the successive steps taken and the principles demonstrated, Mr. Taylor has rendered great service to the engineering fraternity which must result in further progress. It has involved some sacrifice, as he states that it will cut off his former means of financing the experiments. He hopes, however, that the money required to complete the work may be obtained from some other source. We may add that it will be strange, indeed, if the means are not forthcoming, should he desire to continue to pursue his most valuable investigations.

Concentrating Machine Tool Lines.

The condition of the machine tool market is bringing about a much greater degree of specialization of production. This is not only true in the older shops where the product was formerly widely diversified, a condition that has continued to exist in a lesser degree, but also among those manufacturers who have entered the field since the period of highly specialized methods had its beginning. Whole lines of tools are being discarded, and lines are being simplified by the throwing out of those types and sizes for which the demand is small by comparison with other tools. One radial drill builder has discontinued the manufacture of all sizes but one. Planer builders are concentrating on a few sizes. One builder of engine lathes has put aside several machines which have been in active demand, though not to the same extent as others of his line. These are simply instances. Similar conditions exist pretty much everywhere in the machine tool industry.

It is a wholly natural result of the wonderful demand for machinery. The higher the degree of concentration of product the greater the output and the profit. To take the case of the radial drill builder, he is naturally able to produce a greater number of machines of one exact type and size than of a variety of sizes. By declining to accept orders for other machines he occasionally sells to his disappointed customers tools of the one size which he can furnish, because they prefer to get something to do their work even if it is not exactly what they are seeking, rather than to go without. Other cus-

tomers seek other makers of radials, who may be led to pay greater attention to these other sizes. The machine tool builder, when he discards a line, helps some other manufacturer who specializes on that type of machine. The same is true of a discarded size. The outcome of this tendency toward specialization is important and to a certain extent will have a permanent effect.

The maximum of increased production resulting from greater concentration of effort must reach a very considerable total. This helps the customer who is straining every effort to get machinery with which to add to his product and thereby to keep closer to the demands of his market. Every machine tool put into operation helps more than one industry. The comparison of the row of bricks placed on end holds good in this connection. The falling of the first brick causes the others to follow, one after the other. The machine tool is the first brick of a long row of increases in industrial production. As pig iron is the basis of prosperity, so is the machine tool the basis of manufacturing activity.

When business slackens there will be some reversion to former conditions of machine tool production, but striking the balance of the stride onward toward specialized production and the backward step that will come with a decrease in demand, a material gain will probably be found. The manufacture of discarded sizes will perhaps be resumed in many instances, though not in all, but discarded types are less likely again to find places in the catalogues of their former builders. It has been suggested that as a result of the education of customers under the new conditions certain lines of machinery may be simplified by the elimination of some long retained standard sizes.

Bar Iron and the Scrap Market.

Bar iron, as has been demonstrated in a marked way in the past year, is subject to influences which often put its price out of alignment with other rolling mill products. While muck bar iron keeps pace generally with the pig iron market common bar iron advances and declines within certain limits according to the state of the market for scrap. The conditions of the past two years have been exceptional, it is true, in that the supply of steel has not been plentiful enough to cause a diversion from iron to steel on the putting up of bar iron beyond a parity with steel. When both were nearer the 1 cent basis the price often determined whether the continuous bar mill of a steel company or an iron rolling mill got the business. But more recently the scrapping and busheling furnaces have had to make up to an extent for the failure of converting and open hearth melting capacity to care for certain lines of consumption. As forge iron is largely the off product of blast furnaces burdened for foundry iron, and furnace managers have been crowded in the past year to produce a maximum of the higher foundry grades, the old material market has had to do heavy duty. Its course, moreover, has by no means kept equal step with pig iron and with steel. It has been subject to such local manipulations as attend the buying and selling operations of important dealers. It is in his alternating role of bull and bear, according as he is unloading or accumulating material, that the scrap dealer chiefly differs from the manufacturer of a product. The latter consistently favors a well maintained or an ascending market for what he produces.

In the régime of high raw materials and of moderate prices for finished products, under which the iron trade has been working of late years, any advances that have come in the wrought scrap market have been more truly the cause of the marking up of bar iron than higher prices of steel-making raw materials have been the cause of advances in finished forms of steel. The steel company owning its own ore and coal can scarcely say, for example, when Bessemer pig iron or steel billets have advanced, that its cost has been enhanced. Should the mechanical puddler come into more general use the production of rolled iron might be brought more nearly in line with finished steel, in that manufacturers would have better assurance as to their costs than is now possible. It is an anomalous condition that puts the cost of an important iron product so largely in the hands of merchant interests that in a sense are outside the iron trade. Iron mining, coke oven and blast furnace connections are now indispensable to steel manufacture on any scale. The iron manufacturer, under present conditions, can lay hold of no such means of independence. For him, be his output large or small, there is no alternative but a constant attitude of offense and defense against the scrap merchant.

Grinding Machines in Jobbing Shops.

The grinding machine promises to form an important part of the equipment of the jobbing machine shop of the future. Machine shop practice now demands a large amount of grinding because more perfect cylindrical work is required, and the jobbing shop may find that its customers' work, both new and in making repairs, will call for something more perfect than can be secured by machining in a lathe. Doubtless the large industrial centers will have shops making a specialty of grinding, exclusive of other work excepting as an adjunct of the grinder. The equipment of such establishments will include not only the ordinary plain and universal grinder, but machines with scope extensive enough to take care of cylindrical work up to the large sizes.

There are to-day shops where the chief purposes of existence is to do grinding, generally automobile parts which the automobile builder finds it cheaper to have done outside of his own works. These shops do not disdain other similar work, and their owners look with confidence to the time when the line of their customers will be considerably diversified. There are many manufacturing establishments in which grinding is necessary for certain classes or parts of work, but where it does not really pay to install a grinding equipment sufficient to do all that may be required. It may be that a few large cylinders must be ground, or a few parts made round internally, work which in either case is beyond the scope of the ordinary universal or plain grinder. The parts may be more cheaply procured from some outside shop. Works having grinding machines take in much of this class of work at a satisfactory profit, and the customer can better afford to pay the price charged than to maintain a grinding equipment of his own which must stand idle much of the time, or else necessitate the seeking of work for it to do from outside customers. The ordinary jobbing shop of to-day is not equipped with the most modern tools, but they are more apt to savor of another generation. One first-rate grinding machine will give new life to lathes dating from before the time of precision work, as the term is now understood, for grinding will give the necessary cylindrical form after the lathe has accomplished the roughing. But the great demand on the jobbing shop will be for work already prepared for the grinding machine.

The Manufacturer and the Railroads.

Any movement calculated to bring the railroad and the manufacturer located upon its system into more intimate and friendly touch must work out to the benefit of industry. There is apt to be friction regarding rates, deliveries at the works and shipments to customers, and frequently the trouble is due to misunderstanding. Many of the railroads have been slow to realize this and to take measures to eliminate the condition, and the manufacturer in too many cases has been made to feel antagonistic to the railroad on general principles. The large industrial interests do not feel this to such an extent, because they maintain experienced men to look after all shipments, and these men are usually in close touch with the railroads, but the industry of ordinary size cannot afford a special department of this sort. It is therefore interesting to note how an important railroad system proposes to bring about a better understanding with its patrons. The New York, New Haven & Hartford Railroad is about to inaugurate the employment of a corps of experts in its freight department, whose duty it shall be to get into intimate and friendly touch with all industries upon the company's system. These agents will visit every manufacturing industry at least once in two weeks. The intention is that a relationship shall be established which will work to the mutual advantage of both manufacturer and railroad. The better knowledge of conditions which must be obtained by the railroad if it uses the right sort of men as its agents should assist in the building up of industries and consequently in increased earnings of the railroad.

CORRESPONDENCE.

The Gayley Dry Blast Process.

To the Editor: I have read with much interest and some amusement the correspondence that has been going on of late in your columns anent the Gayley dry blast process. In your issue of October 25 J. E. Johnson, Jr., inveighs somewhat virulently against German engineers for being "unable to understand the reason for the great saving made by Mr. Gayley's dry blast process," and it is certainly true that the failure to account for phenomena by no means disproves these phenomena. Yet when Mr. Johnson says, as he does in your issue of November 8, that "a clear, logical and complete explanation of the action of the dry blast" has been given, he rather overstates the case. Certain new theories of the blast furnace have been advanced, it is true, but as yet they remain theories, and it would be well if Mr. Johnson were to remember an "old, old fact," that the proof of the pudding is in the eating, and that up to now, considering the length of time the Gayley process has been before the world, there has been a marked absence of any result from the enthusiasm with which Mr. Johnson says "Americans have turned to Mr. Gayley's invention."

It is true that several furnaces in the United States are said to be installing the necessary plant for the process, but if there be anything like the saving apparent from the figures published by Mr. Gayley, surely ere now in such a go-ahead country as the United States scores of furnaces would have installed the refrigeration plants. Perhaps, however, as Mr. Johnson states will be the case with the gas engine, "in their own good time American engineers will take hold" of the process.

After all, Mr. Johnson must be aware that it is an extremely difficult thing to get data on a subject of this sort which shall be at the same time both reliable and comparable, and the most satisfactory proof to Europeans of the success of the Gayley process would be its rapid extension outside the domains of the United States Steel Corporation. It would be interesting to a European to know whether Mr. Johnson has any furnaces under his charge fitted with refrigerating plant.

J. SPENCER HOLLINGS.

BRYMBO, ENGLAND, November 19, 1906.

The National Steel & Wire Company's Business Report.

In connection with the consolidation plan outlined in *The Iron Age* of November 29 a pamphlet report has been issued giving the balance sheet of the National Steel & Wire Company (the holding company) on June 30, 1906, and also reports for the controlled companies for the year ending June 30, from which the following extracts are taken:

Safety Insulated Wire & Cable Company, Bayonne, N. J.—The total output for the year ending June 30, 1905, was $1,363,481; for the year just ended, $2,036,904—a gain of $668,423, or 47 per cent., without any additional machinery. It has been decided to expend about $3000 for 100 additional braiding machines. The cost of labor for the earlier year was $237,105, or 17.31 per cent. of the total output, while for the year just ended it was $274,441, or 12.98 per cent. of the total output—a saving of 25 per cent. As the greater portion of this saving has been made during the last half of the year, it is fair to assume that next year's showing will be very materially increased. Due to the complete reorganization of the administrative and selling forces there has been a saving in the past year of $36,989 in these departments.

National Wire Corporation, New Haven, Conn.—The total output for the year ending June 30, 1905, amounted to $1,246,374; for the year just ending, $1,440,641, a gain of $194,267, or a gain of 16½ per cent. The cost of labor for the earlier year was $368,664, or 29.4 per cent. of the total output, while for the year just ending it was $398,953, or 27.7 per cent., making a saving of 14 per cent. The total administration and selling expense for the year 1904-1905 was $138,138, while that for the past year amounted to $94,101, a saving of $44,027. The physical condition of the plant is better than ever before. During the year buildings to the amount of $79,099 and machinery to the amount of $53,842, a total of $132,941, have been added to the plant.

National Steel Foundry Company, New Haven, Conn.—The total output for the year ending June 30, 1905, was $158,768; for the year just ending, $356,130, making an increase of $197,362, or 124 per cent. The cost of labor for the earlier year was $91,110, or 58 per cent. of the total output, while for the past year it was $178,560, or 50 per cent., making a saving of 16 per cent. The reduction in administration expenses was $19,186.

De Kalb & Union Fence Companies, De Kalb, Ill.—Sales from July 1 up to the present time are considerably ahead of last year, being about double. The principal part of our increased business has been on Eagle and Union barb wire, this increase alone being 2,169,038 lb. over the previous year. The increase in sales should have been more, but as prices for all wire commodities were lower it is quite reasonable, and, in fact, satisfactory.

National Steel & Wire Company.—Balance Sheet June 30, 1906.

Assets.

Investments in stocks and bonds	$7,177,896
Furniture and fixtures	1,054
Receivables	2,401,394
Cash	45,035
Total	$9,625,379

Liabilities.

Preferred stock	$3,633,700
Common stock	3,875,817
Special loans by directors	1,372,125
Due controlled companies	305,690
Bills payable	286,768
Reserve for unpaid dividend, May, 1906	56,834
Surplus	94,445
Total	$9,625,379

Benj. W. Head, managing director of the British corporation of the Wellman-Seaver-Morgan Company, Limited, has recently purchased from the Electric Controller & Supply Company, Cleveland, Ohio, patent rights and detailed drawings in connection with the various types of Dinkey ventilated and other controllers, and also for special types of magnetic motor brakes. It is the intention to form an English company under the same name as the American company, and to manufacture these controllers in Great Britain.

Gas Producer Experiments.*

BY DR. KARL WENDT.

In Experiment 1 the arrangement was as shown in Fig. 1, dry air (no steam) being used. To diminish the loss of combustible matter when cleaning the grate a water seal was provided by bringing the walls 2 ft. 4 in. lower and connecting the blast pipe to the center. Dry air was still used and Experiment 2 was conducted with this modification. Difficulties caused by excessive clinkering led to the installation of a steam blower, using strongly superheated steam, with which arrangement Experiment 3 was made.

In order to get samples for analysis and to use a pyrometer, seven holes were made through the walls of the producer vertically above each other and 10 in. apart. The seventh or lowest hole was at the level of the blast pipe, so that the top hole was 5 ft. above, or 5 ft. 10 in. below the charging floor. The results of these tests (A to E) are given below in tabular form, from which it will be seen that the temperature at the outlet varies considerably, while in the producer it is fairly constant:

Test A.—Air Only.

Zone.	Analysis of gas by volume.—Per cent. CO_2	CnHm.	O.	CO.	CH_4.	H.	N.	Aver. temperature. Deg. F.
7	15.0	..	..	9.7	..	..	75.3	....
6	0.2	..	..	34.1	..	..	65.7	2,552
5	0.2	..	..	34.3	..	..	65.5	....
4	..	..	..	34.5	..	0.4	65.1	....
3	0.4	..	..	33.4	0.3	2.4	63.5	2,282
2	0.6	..	..	30.0	0.6	11.7	57.1	....
1	1.0	..	..	28.9	2.0	9.8	58.3	1,886
Outlet	0.7	..	..	31.3	2.4	6.3	59.3	1,076

NOTE.—At Zone 3 and those above the presence of tar could be proved qualitatively by a prolonged test with white paper.
Air pressure, = 3.54 in. water.
Lowest stock level, 57 in. below the floor

Test B.—Air Only.

Zone.	Analysis of gas by volume.—Per cent. CO_2	CnHm.	O.	CO.	CH_4.	H.	N.	Aver. temperature. Deg. F.
7	8.8	..	..	19.6	..	..	71.6	.
6	..	..	..	34.5	..	..	65.5	2,516
5	0.2	..	..	34.5	..	..	65.3	....
4	0.8	..	..	32.7	0.4	0.7	65.4	2,282
3	1.0	..	..	28.9	2.0	11.9	56.2	....
2	2.0	..	..	26.6	3.8	10.0	57.5	2,093
1	2.0	..	..	27.2	4.2	12.3	54.3	....
Outlet	1.0	..	..	30.9	3.2	6.4	58.5	1,130

NOTE.—Tar shown at Zone 3 and above.
Air pressure = 3.03 in. water.
Lowest stock level, approximately 59 in. below the floor.

Test C.—Steam and Air.

Zone.	Analysis of gas by volume.—Per cent. CO_2	CnHm.	O.	CO.	CH_4.	H.	N.	Aver. temperature. Deg. F.
7	3.0	..	17.8	....	..	..	79.2	....
6	9.3	..	..	22.4	0.3	10.7	57.3	1,778
5	3.4	..	..	31.3	1.2	14.7	49.4	....
4	2.9	..	..	31.9	1.7	17.6	45.9	1,661
3	5.0	trace	..	28.2	4.6	20.3	41.9	....
Outlet	5.0	..	..	28.6	3.0	16.7	46.7	770

NOTE.—Tar shown at Zone 4 and above.
Steam pressure = 51.5 lb.
Lowest stock level, 65 in. below the floor.

Test D.—Steam and Air.

Zone.	Analysis of gas by volume.—Per cent. CO_2.	CnHm.	O.	CO.	CH_4.	H.	N.	Aver. temperature. Deg. F.
7	..	..	21.0	....	..	..	79.0	....
6	16.8	..	0.4	6.0	..	3.2	73.6	....
5	9.4	..	..	20.0	0.8	10.3	59.5	1,580
4	8.5	..	..	22.7	1.4	10.8	56.6	....
3	9.8	trace	..	20.2	2.7	12.4	54.9	1,310
2	12.1	trace	..	15.7	2.3	16.1	52.8	....
1	10.8	0.3	..	18.1	5.0	15.6	50.2	Below 572
Outlet	10.5	0.3	..	19.2	2.8	14.9	52.3	

NOTE.—Producer working very badly on account of low pressure and very wet steam. Consumption of coal was approximately 8800 lb. in 24 hrs. Trace of tar found at hole No. 6. The fact that at Zone 7 all the oxygen from the air was still free was probably due to the ashes being too high in the producer.
Steam pressure = 28 lb.
Lowest stock level, 57 in. below the floor.

* From *Stahl und Eisen*, October 1, 1906.

Test E.—Steam and Air.

Zone.	Analysis of gas in volume.—Per cent. CO_2	CnHm.	O.	CO.	CH_4.	H.	N.	Aver. temperature. Deg. F.
7	11.4	..	9.5	...	..	...	79.1	....
6	9.2	..	..	22.0	0.4	10.8	57.5	2,030
5	5.5	..	..	28.0	0.9	13.7	51.9	....
4	3.0	..	..	32.7	1.2	17.9	45.2	1,697
3	5.0	..	..	28.7	5.0	21.8	39.5	....
2	6.0	..	..	28.3	4.8	20.7	40.2	1,490
1	5.3	..	..	28.0	4.1	19.0	43.6	....
Outlet	5.5	..	..	26.8	3.4	14.6	49.7	824

NOTE.—Tar at hole No. 3 and above.
Steam pressure = 73.5 lb.
Lowest stock level, approximately 57 in. below the floor.

From these figures the following conclusions are drawn: In the lower zones the carbon is gasified according to the equations $C + 2O = CO_2$ and $C + O = CO$. The hotter the producer the more rapidly the oxygen is taken up, so that in the dry air experiments it is not found even in the lowest zones, as is the case when steam is introduced. At a high temperature carbon monoxide is formed simultaneously with carbonic acid, and the hotter the producer the more rapidly and completely does the reaction $CO_2 + C = 2CO$ take place, although temperature is not the only factor in this. Where steam is used the following reactions also occur at this time:

$$CO + H_2O = CO_2 + 2H.$$
$$C + 2H_2O = CO_2 + 4H.$$
$$C + H_2O = CO + 2H.$$

The first two seem to predominate, which probably accounts for the high percentage of CO_2 in this method of operating as compared with the use of dry air.

In the zones in which the volatile matter of the coal enters into the gas, the reactions are too complicated to be followed in detail. The beginning of the zone of volatilization, *i. e.*, the appearance of the products in the gas, can be approximately calculated from the analysis by deducting the amount of oxygen in the gas from the amount of that element liberated when the nitrogen and hydrogen necessary for the formation of gas are derived only from air and steam. If this shows that the gas does not contain sufficient oxygen to correspond with the amounts of nitrogen and hydrogen, it is clear that a portion of the two latter elements is derived from the volatile matter of the coal; it is assumed that all the oxygen present in the coal exists as chemically combined water which does not go into the gas. Such calculation shows that volatile products are present in zone 3 and upward when dry air is used, and from zone 5 up when steam is used, so that very little volatilization takes place below these points.

To obtain a deeper insight into the working of the producer, the heat distribution is calculated from the results obtained in the form of two "heat balances," developed independently of each other. The calculations are based on the law that the change of a body from one form to another requires a constant amount of heat, whatever intermediate forms it may have passed through. Remembering this law, the process of gas making may be subjected to an exact calculation by dividing it into several operations, which need not necessarily agree with those that actually take place, but may be based on theoretical assumptions which will give the data necessary for calculation. The process may be assumed as follows:

1. The tar and other volatile constituents of the coal are transformed to a gaseous state. This requires a certain amount of heat designated "heat of decomposition Q."

2. To the gas thus formed is added the air, with the accompanying water vapor bringing the latent heat of the latter, and also the heat necessary to raise the temperature of both above that of the atmosphere. This accession of heat is designated Z.

3. By the use of a quantity of heat W1 a certain amount of water vapor is disassociated, or else an excess of hydrogen unites with oxygen to develop heat W2.

4. The elements present unite to form (*m*) gas developing its heat of formation Qg; (*n*) combustible matter in the ash developing heat Qr; (*o*) soot which may be regarded as pure carbon and of which the heat of formation may be neglected.

5. The heat made available by the foregoing processes

is utilized as follows: (*m*) moisture in the producer is transformed into vapor requiring an amount of heat D; (*n*) the gas and its impurities are raised from the temperature of the atmosphere to that of the outlet taking up heat G; (*o*) the ashes, and, in Experiments 2 and 3, the water removed with them are raised from the temperature of the atmosphere to that at which they leave the producer using heat R.

6. The heat not otherwise utilized is the loss by radiation and conduction S.

The heat of formation of the coke in the ashes is very small, as the material contains 96.70 per cent. of carbon, and the total quantity being also small, it may be neglected, so the equation of the "heat balance" will be:

$$Qg \pm W + Z = Q + D + G + R + S.$$

With the exception of S, all the above values may be directly determined by test or calculation, so that S may be obtained by difference. A check is obtainable

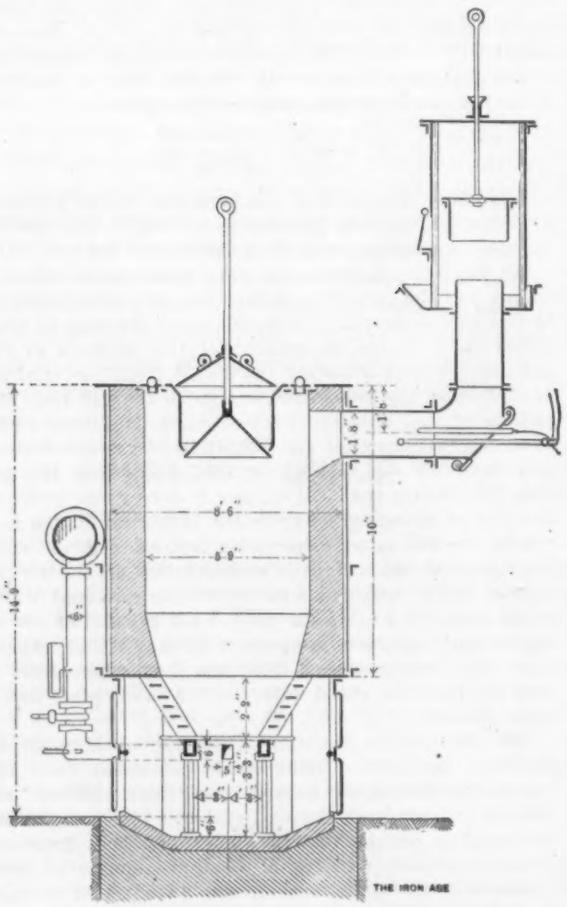


Fig. 1.—Arrangement of Gas Producer as Used in the Experiments.

by comparing the total quality of heat made available at the producer with the total taken from it. The difference will be the loss. This heat with an assumed unit (100 lb.) of coal will be:

a. The heat value of this unit = Hk B.t.u.

b The heat in the blast = Z.

The products of the producer, the heat values of which are removed from it, are:

1. Uncleaned gas, of which the heat value is Hg B.t.u. and increased temperature G. B.t.u.; so that the total heat removed is Hg + G.

2. Ashes, of which the combustible matter has a heat value of Hr B.t.u. and of which the increased temperature represents R B.t.u. The total heat hereby removed is therefore Hr + R, in which R includes also the heat in the increased temperature of the water removed with the ashes in Experiments 2 and 3.

3. The loss by radiation and conduction S.

We therefore get a second equation representing the distribution of heat, namely:

$$Hk + Z = Hg + G + Hr + R + S.$$

Here too all the values may be found by experiment with the exception of S, enabling the latter to be determined by difference. A comparison of the values of S found by the two methods thus affords a check as to the exactitude of the experiments. The results of the numerous tests, measurements and calculations are given in Table I.

Table I.

Experiment	No. 1.	No. 2.	No. 3.
Period of test, hours	48	51	71
Coal charged during test, pounds	31,879	30,688	32,540
Coal consumed per hour, approximately, pounds	664	602	458
Average external temperature, degrees F.	47.3	48.2	50.0
Average barometer, inches	29.40	29.44	29.53
Average temperature of blast, degrees F.	69.8	69.8	163.4
Average blast pressure, inches water	2.75	2.67	...
Average blast moisture per cubic foot, grains	3.2	2.7	61.2
Average steam pressure in No. 3, pounds	...	...	41.6
Average steam temperature, degrees F.	...	...	669.8
Average temperature in water seal, degrees F.	...	120.2	113.0
Average temperature of gas at outlet, degrees F.	1,200.2	1,180.4	984.2
Dry ashes per 100 lb. coal, pounds	22.27	16.80	14.36
Combustible matter in same, pounds	6.43	2.54	1.64
Water taken from seal with ashes, pounds	...	9.23	8.59
Average gas analysis by volume:			
CO_2, per cent.	0.67	0.85	5.40
O, per cent.	0	0	0
CO, per cent.	31.13	30.65	27.01
CH_4, per cent.	2.40	2.55	2.93
H, per cent.	6.57	7.10	14.55
N, per cent.	59.23	58.85	50.11
Average upper heating value of 1 cu. ft., B.t.u.	152.08	158.26	174.11
Average lower heating value of 1 cu. ft., B.t.u.	145.90	151.63	163.09
Impurities in 1 cu. ft. gas:			
H_2O, grains	30.84	31.29	38.02
Tar, grains	5.89	7.82	6.71
Flue dust with 13.5 per cent. soot, grains	2.27	2.75	0.42
Calculated weight of 1 cu. ft. clean gas, pounds	0.07303	0.07268	0.06918
Calculated weight of 1 cu. ft. uncleaned gas, pounds	0.07860	0.07866	0.07563
Specific heat of uncleaned gas	0.34659+ *0.0000155t	0.34958+ *0.000016t	0.35686+ *0.0000277t
Composition of coal, per cent.:			
C	57.86	57.21	58.14
H	3.72	3.67	3.38
S	0.70	0.69	0.40
O	9.20	9.10	9.60
N	0.60	0.60	0.70
Hygros. water	9.40	10.42	10.05
Ash	18.52	18.31	17.73
Totals	100.00	100.00	100.00
Upper heat value of coal, B.t.u.	10,053	9,940	10,076
Lower heat value of coal, B.t.u.	9,590	9,470	9,639
Composition of its dry combustible matter, per cent.:			
C		80.26	80.50
H		5.16	4.68
S		0.97	0.55
O and N		13.61	14.27
Totals		100.00	100.00
Upper heat value of dry combustion, B.t.u.		13,948	13,952

* t = temperature in degrees F.

Using these data, the values found in Table II. are calculated, and substitution in the first equation gives the results tabulated in Table III. As a check, the values so found for loss by radiation, &c., S, are inserted in the second equation (using the upper heat values of the various substances) with the result shown in Table IV.

Table II.

Experiment	No. 1.	No. 2.	No. 3.
Per 100 lb. coal:			
Gas produced per cubic foot	4,251	4,442	4,490
Air introduced	255.0	264.86	227.71
Water dissassociated or formed*	+6.7833	+2.7468	−18.2882
Steam derived from quenching water or water seal, pounds	0.98	5.29	6.31

* That is, the hydrogen liberated from the coal by the heat where air only is used (experiments 1 and 2) does not all enter into the gas and coke as H and CH_4, the surplus being oxidized to water with the formation of heat W_2. When both air and steam are used (experiment 3), on the other hand, additional water must be disassociated, causing the absorption of heat W.

Table III.

Experiment	No. 1. B.t.u.	No. 2. B.t.u.	No. 3. B.t.u.
(*a*) Positive heat:			
1. Heat of formation of gas, Qg	217,321	228,631	309,283
2. Combustion of excess free hydrogen, W_2	46,370	18,778	.....
3. From external sources, Z:			
(*m*) Temperature of blast above that of atmosphere	1,361	1,359	.....
(*n*) Latent heat of steam contained in blast	1,696	1,512	2,149
Also in Experiment 3:			
(*m*) Heat in steam used in blower.	....	.....	28,004
(*o*) Latent heat of same	....	.....	4,766
Totals	266,748	250,280	344,202
(*b*) Negative heat:			
1. Decomposition of coal, Q	43,195	52,598	53,298
2. Vaporization of H_2O contained in the gas, D	20,218	21,445	26,341
3. Raising temperature of uncleaned gas from temperature of atmosphere to that of outlet, G	108,851	112,719	96,973
4. Raising heat of ashes and water removed with them from temperature of atmosphere to that of removal, R	10,020	966	767
5. In experiment 3, heat necessary to disassociate 2.0298 lb. hydrogen from water, W	....	.....	124,882
6. Radiation and conduction, S	74,464	62,552	41,942
Totals	256,748	250,280	344,203

Table IV.

Experiment	No. 1. B.t.u.	No. 2. B.t.u.	No. 3. B.t.u.
The following quantities of heat are available for the process::			
1. The heat of combustion of 100 lb. coal, Hk	1,005,300	993,960	1,007,640
2. Heat entering the producer from external sources, Z.	3,058	2,871	34,920
Totals	1,008,358	996,831	1,042,560
The following quantities reappear:			
1. Heat of combustion of cleaned gas, Hg	646,232	702,866	781,533
2. Latent heat of steam in gas, Hg	20,218	21,445	26,341
3. Heat of combustion of tar in gas, Hg	51,086	70,978	61,533
4. Heat of combustion of soot in gas, Hg	2,763	3,344	524
5. As sensible heat of the gas and its impurities, G	108,851	112,718	96,973
6. As heat of combustion of coke in the ashes, Hr	93,229	36,828	23,778
7. As sensible heat of ashes, R.	10,021	967	767
Totals	1,006,864	1,011,697	1,033,391

The figures obtained by the two methods agree well, and, allowing for errors of experiment, the heat quantities available in the producer are shown as percentages of the whole in Table V. The heat used for the production of steam in Experiments 1 and 2, for driving the mechanical blower, and in Experiment 3, for the steam blower, amounted in the three cases to 5992, 6031 and 102890 B.t.u. respectively. Taking these values into account, the disposition of the available heat is given in percentages in Table VI.

Table V.

Experiment	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.
1. Heat of combustion of cleaned gas.	64.18	69.47	75.63
2. Latent heat of steam in gas	2.01	2.12	2.55
3. Heat of combustion of tar in gas.	5.07	7.02	5.95
4. Heat of combustion of soot in gas.	0.28	0.33	0.05
5. Sensible heat of uncleaned gas	10.81	11.14	9.38
6. Heat of combustion of coke in ashes	9.26	3.64	2.30
7. Sensible heat of ashes	1.00	0.10	0.08
8. Heat of radiation	7.39	6.18	4.06
Totals	100.00	100.00	100.00

Table VI.

Experiment	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.
1. On the grate of the boiler	0.28	0.28	4.66
2. Available heat in cleaned gas	64.59	70.06	73.05
3. Available heat in tar	5.16	7.15	5.95
4. Available heat in soot	0.29	0.35	0.05
5. Available heat in coke in ashes	9.54	3.82	2.35
6. Sensible heat in uncleaned gas	11.34	11.73	9.67
7. Sensible heat in ashes	1.04	0.10	0.08
8. Radiation from producer	7.76	6.51	4.19
Totals	100.00	100.00	100.00

These comparisons show the relative advantages of the different arrangements of the producer, but do not afford a comparison of the two methods of making gas—with or without steam—as the loss by combustible matter in the coal is dependent far more on the construction of the grate than the process itself. A comparison is therefore made of the two methods by taking as the true amount of heat used the difference between the heat value of the coal charged and that of the coke in the ashes. The results of Experiment 2 are not taken into account, as the large quantity of clinker prevented proper working for any length of time. A comparison is made in Table VII., which shows that the use of steam is advantageous from a purely economic point of view, apart from the decreased clinkering.

Table VII.

	Air only, as in Experiment 1. Per cent.	Air and steam as in Experiment 3. Per cent.
1. Under the boiler	0.31	4.78
2. Heat available in clean gas	71.40	74.80
3. Heat available in tar	5.70	6.08
4. Heat available in soot	0.32	0.05
5. Sensible heat of uncleaned gas	12.54	9.92
6. Sensible heat of ashes	1.15	0.08
7. Radiation from the producer	8.58	4.29
Totals	100.00	100.00

The use of steam has, however, the disadvantage that the amount of coal gasified in a given time is less. The gas made by the use of steam is better than the other for use in internal combustion engines, as, on account of the higher percentage of hydrogen, its ignition point is lower. For furnaces the matter is more doubtful, for, in spite of its higher heat value, the pyrometric effect may be lower than that of gas produced from the same coal without steam. This will be true under the following conditions:

1. If the steam blown gas contains more water vapor than that made with dry air on account of some of the steam not being disassociated.

2. If the temperature of combustion of hydrogen, in spite of its higher heat value, is higher than that of carbon monoxide when burnt with air.

3. It is not yet proved that hydrogen after being strongly heated in a regenerative furnace has the same heat value as when burnt at atmospheric pressure, as H_2O, especially in contact with molten steel, is more easily disassociated than CO_2.

From the above considerations the conclusion is reached that, when using fuel containing but little volatile matter, the use of steam can be more readily recommended than when other fuels are used for making furnace gas, as the former is more suitable for the production of high temperatures in the producer than the latter. This is necessary for the complete disassociation of the water vapor apart from its other favorable influence on the composition of the gas. Under proper conditions a gas can be obtained from such fuel when steam is used which has a higher combustion temperature than when dry air is employed. On the other hand, if, on account of local conditions, the gas is cooled before using the use of steam will probably be more economical, as any water vapor present will be condensed. If it is desired to introduce steam to prevent clinkering, it is recommended that not more be used than is absolutely necessary in order that the temperature in the producer may be kept as high as possible and to prevent the formation of clinker by designing the producer for that end.

The Free Public Library of Newark, N. J., has a large reading room seating 125 people. In a room adjoining the reading room is a trade catalogue collection, now containing about 600 catalogues. The library subscribes for many of the best technical and scientific journals. With a limited amount to spend each year for periodicals, it is impossible to take all. The library would be glad to place in the reading room any trade papers that the publishers would be willing to send for 1907 and feels confident that they would be read by many.

Electrical Equipment for Iron Mines.

An evidence of the increasing use of electricity in mining is to be had in the new power plant which Witherbee, Sherman & Co. are erecting on the Lake Champlain shore at Port Henry, N. Y. It is not generally known that a considerable part of the annual iron ore supply in this country is obtained from the lower Champlain Lake region. The various shafts of this company alone yield from 500,000 to 600,000 tons of iron ore yearly, while with the new electrical equipment the ultimate output will be 1,000,000 tons.

Since the principal shafts of the mines are scattered over a considerable area electricity affords the most flexible means of transmitting power, and is used almost universally. Power is generated at present both by water and steam. At Mineville there is a steam plant, with a 750-kw. engine driven generator, which supplies current at 3300 volts for local distribution. This power is supplemented by two small water power plants; a 300-kw. water wheel driven generator unit is located at Wadham's Mills and a 370-kw. unit at Kingdom, about 8 miles from this point. At Wadham's Mills a Morgan-Smith water turbine is used, operating under a 48-ft. head. Power at the Kingdom plant is furnished by a Pelton impulse wheel under a head of 290 ft., water being carried through a 32-in. pipe a distance of 1⅛ miles from the reservoir. These stations are situated about 11 miles from Mineville and deliver current at Mineville at a potential of 6000 volts. This voltage, made desirable because of the saving in transmission, is stepped down to 3300 at Mineville and is used in conjunction with the 750-kw. 3300-volt steam driven machine to supply power at the various shafts. Induction motors are used for driving hoists, pumps, air compressors, &c., operated at 25 cycles and 440 volts.

The power house which is being built at Port Henry is some 6 miles from the mines, and will be interconnected with the other sources to supply the increasing demand for power. The station building and the stack is built of monolithic reinforced concrete, made from Iron Clad Portland cement, manufactured by the Glens Falls Portland Cement Company, mixed with tailings from the mines. The station will be fireproof throughout, and a typical example of the use of this building material.

The main building containing the boilers is 116 by 54 ft., while the turbine generator room measures 39 by 59 ft. and extends at right angles from the center of the main structure. Steam will be generated by four 500-hp. Babcock & Wilcox boilers, arranged in pairs on either side of a 175-ft. stack, which occupies about the center of the power house. There is space for two more boilers of the same capacity, one at the side of each pair. The boilers are hand fired, and coal is conveyed to each by a car on a track running the length of the building. This car is filled from an overhead hopper through a hinged chute. The hopper is filled by a vertical bucket conveyor which carries the coal from a pit filled directly from cars outside the building.

The generating equipment comprises an 800-kw. Curtis steam turbine generator, which will deliver current directly to the line at a potential of 6600 volts and 25 cycles. The compactness of the vertical unit has permitted a remarkably economical disposition of machinery in the generating room. Space is left for the installation of a second turbine, which will probably be installed at once.

The switchboard is located in a gallery with a reenforced concrete floor. On this floor is placed also the motor driven exciter sets, and space is available for two frequency changer lighting sets. A supplementary exciting unit is provided by a 25-kw. horizontal Curtis steam turbine generator. The entire electrical equipment for this power house will be furnished by the General Electric Company.

Victor Buetner, mechanical engineer, Westinghouse Building, Pittsburgh, Pa., has designed a steel grand stand for a race track at Steubenville, Ohio.

The Mechanical Engineers' Meeting.

A record breaking attendance is expected at the twenty-seventh annual meeting of the American Society of Mechanical Engineers, which was formally opened Tuesday evening, December 4, in the assembly rooms of the New York Edison Company, 44 West Twenty-seventh street, New York City. The registration of members and guests at the close of that evening was 765, and the number will probably reach 1000 before the end of the convention. The meeting was called to order about nine o'clock by President Fred W. Taylor, and a motion was immediately made that because of the length and number of the papers to be presented, all discussion should be limited to five minutes. This motion was seconded and carried.

The event of the opening session was the presentation of the president's address on "The Art of Cutting Metals," an extract from which appears in another part of this issue. At the conclusion of Mr. Taylor's address a demonstration of the use of the slide rule for computing cutting speeds and feeds for the most economical cutting of metals was made from a greatly enlarged model. This slide rule is the invention of the author and is regarded by him as one of the most important results of the researches covered in the paper.

The report on the election of officers for the ensuing year declared the following to be elected: Prof. F. R. Hutton, president; J. W. Lieb, Jr., P. W. Gates, and Alexander Dow, vice-presidents; A. J. Caldwell, G. M. Basford and A. L. Riker, managers, and W. H. Wiley, treasurer. The retiring president called upon C. W. Hunt and W. R. Warner to escort the newly elected president to the chair, and Professor Hutton expressed his appreciation of the honor conferred upon him. Resuming then his capacity of secretary, which position he has held continuously for the last 23 years, he announced certain changes and additions to the previously prepared programme. An extra excursion to the proving grounds of the Ordnance Department at Sandy Hook, as the guests of the Engineering Department of the United States Army, will consume practically all of Friday, making it necessary to put the session scheduled for that morning forward to Wednesday evening, which was originally unassigned. The Thursday morning session and the programme otherwise remain unchanged from that printed in the last issue of *The Iron Age*.

Several of the papers presented Wednesday will be found in abstract elsewhere in this issue, but further mention of the proceedings at these sessions will be deferred until the complete report of the meeting which will be given next week.

Starting with the Interstate Commerce Commission's figure of $159,000,000 as the fuel bill for all the railroads in the United States in 1904, the *Railway Age* estimates an average cost of $1.50 a ton, giving a total consumption of 106,000,000 tons. The number of locomotives owned by railroads in the year 1904 was 46,885, and assuming 8 per cent. of these to be in the shop under repairs, there remain 37,508 engines in service, and this number divided into 106,000,000 tons gives 2826 tons as the average consumption of coal per engine year.

Over 500,000,000 gal. of water are pumped out of the anthracite coal mines of Pennsylvania every day in the year. The exact average for 1905 was 633,000,000 gal. a day. Nearly 1000 powerful engines, delivering from mine bottom to surface 500,000 gal. of water a minute are required. Mines may be shut down and coal production suspended, but the water flows on forever. The cost of removing it is one of the important items of expense that make up the price of anthracite.

OBITUARY.

JOSEPH J. CROWTHER.

Joseph J. Crowther, a veteran blast furnaceman, died at Lorain, Ohio, November 29, aged 82 years. He was born in Wolverhampton, England, and with his father and two brothers, also furnacemen, came to the United States in 1844. They first operated a charcoal furnace at Morgantown, W. Va., and later built a furnace at Brady's Bend, Pa. Near Youngstown, Ohio, they became interested in the Mill Creek Furnace, and J. J. Crowther had a part in building the Lowellville, Ohio, furnace, the successor of which is now owned by the Ohio Iron & Steel Company. Mr. Crowther built the old Eagle Furnace at Brier Hill, Youngstown, which has since been torn down. He went to Wampum, Pa., in 1857, and then to Pittsburgh, where he built the Clinton Furnace for Graff, Bennett & Co. Later he went to Martins Ferry, Ohio, and built a furnace for the Belmont Iron Company, and in 1868 to Newport, Ky., where he built a furnace for the Gaylord Iron Company. In 1873 he took charge of the furnace of Harbaugh, Methias & Owen, at Wood's Run, Pa. Leaving there, he was in charge of Rock Hill furnaces at Orbisonia, Pa., remaining there for nine years, until he went to Ashland, Ky., as superintendent of the furnaces of the Ashland Iron & Coal Company. He remained until 1892, when he retired. His son, E. C. Crowther, Elyria, Ohio, has been connected with a number of Central Western furnaces, and a grandson, Charles Crowther, was at one time in charge of the Carnegie Steel Company's stack at Niles, Ohio.

WILLIAM ALLEN, president of the Wm. Allen & Sons Company, boiler manufacturers, Worcester, Mass., died suddenly November 27, aged 81 years. He was born in Soho, a suburb of Birmingham, England. Descended from a family of engineers through several generations, he was apprenticed to the Bolton & Watts Works, Soho, when he was 16 years old, and remained there until 1849, when he came to America, landing at Boston, where he found employment with Walworth & Mason. A few months later he went to Worcester, where he passed the remainder of his life. He first entered the pistol factory of Allen & Thurber, went thence to William A. Wheeler's foundry and machine shop, and was for a number of years foreman of the Court Mills, conducted by Ruggles, Nourse & Mason, now the Ames Plow Company. In 1872 Mr. Allen became a partner in the new Stewart & Allen Boiler Works, and three years later retired from the firm and bought the Worcester Boiler Works, manufacturer of power and heating boilers. The business was incorporated later as the Wm. Allen & Sons Company, two sons, both now deceased, being associated with the father. Mr. Allen served for several years in the Worcester city government and was a member of the Hancock Club and the Worcester County Mechanics' Association. He leaves a widow, a son and two daughters.

ARTHUR VAUGHAN ABBOTT died in St. Luke's Hospital, New York, December 1, aged 48 years. He was born in New York and was a member of the American Institute of Mining Engineers, vice-president of the American Institute of Electrical Engineers, chief engineer of the Chicago Telephone Company and engineer of Westinghouse, Church, Kerr & Co. Mr. Abbott was well known as a writer on technical subjects, having published books entitled "Electrical Transmission of Energy," "Evolution of a Switchboard," "History and Use of Testing Machines," and "Treatise on Fuel."

The output of finished material from the plant of the South Durham Steel & Iron Company, Limited, Middlesbrough, England, in the company's last fiscal year, 353,000 tons, is referred to by the London *Iron and Coal Trades Review* as "in excess of the make of any other steel making firm in the Kingdom." This output was made possible through the company's association with the Cargo Fleet Iron Company, also of Middlesbrough.

PERSONAL.

W. S. Doyle, formerly connected with the Cleveland office of the American Steel & Wire Company, has been placed in charge of the company's concrete reinforcement department, with headquarters at Chicago.

M. J. Drummond of M. J. Drummond & Co., cast iron pipe manufacturers, 182 Broadway, New York, returned December 3 from a seven weeks' sojourn in Italy. His health had been impaired by a runaway accident, compelling a season of rest and recuperation. He returns in full vigor.

Effective January 1, a number of important changes will be made in the sales force of the Carnegie and Illinois steel companies. W. J. Totten, who has been manager of the St. Louis office of the Carnegie Steel Company for many years, and has likewise represented the Illinois Steel Company in that field, has been appointed assistant general manager of sales of the latter, with headquarters at Chicago. He will be succeeded by W. B. Weston, manager of the New Orleans office of these two companies, while J. R. Mills, Jr., assistant manager of the St. Louis office, will succeed Mr. Weston at New Orleans, not only as representative of the Carnegie and Illinois steel companies, but of the American Sheet & Tin Plate Company as well.

N. A. Christensen, Milwaukee, Wis., has returned from a six months' business trip to Europe where he conducted important negotiations for the Allis-Chalmers Company for the manufacture and sale of his airbrake devices, which are now controlled by that company. Arrangements were made with a Berlin corporation to manufacture airbrakes and air compressors that until now have been manufactured only by the Allis-Chalmers Company. Through this arrangement the Allis-Chalmers Company will be enabled to place its products in an immense foreign field.

Albert Ladd Colby, metallurgical engineer, of New York, who has been abroad for some time, has returned.

J. A. Gunn, general agent for Iowa for the J. I. Case Threshing Machine Company, has resigned that position, to take effect January 1, and will then become treasurer of the Gould Balance Valve Company, Kellogg, Iowa, of which he is one of the principal stockholders.

E. G. Spilsbury, consulting engineer, 45 Broadway, New York, has returned from Europe, where he spent the last five months. Mr. Spilsbury went over with the mining engineers in July.

A Huge Air Washer.—The Buffalo Forge Company now has under construction at its shop in Buffalo, N. Y., the largest air washer and humidifier it has yet contracted for. The washing chamber measures 18 ft. 6 in. x 14 ft. 10½ in. high, has a sectional area for air passage of 220 sq. ft. and will provide for a total capacity of 110,000 cu. ft. of air per minute, with an air velocity of 500 ft. per minute. The washing will be accomplished by 448 brass cyclone spray nozzles, which atomize the wash water by centrifugal action, delivering approximately 3 lb. of water per minute. This provides over 43 tons of water per hour for washing, all of which must be taken out of the air again by the 250 eliminator plates (made of No. 24 galvanized sheets), only such portion of water vapor remaining in the air as will bring the humidity to the percentage provided by the automatic control. The water for the spray nozzle is furnished by a 3-in. belt driven Buffalo centrifugal pump, the water level in the settling tank being kept constant by the ¾-in. ball float regulating valve which governs the supply. Two metal doors, 16 x 36 in., with glass windows, provide access to the washing chamber. This immense air washer will be installed in No. 6 Public School, New York City.

The bar and rod mills of the Sharon plant of the American Steel & Wire Company established a new record for 12 hours when they turned out 420 tons on the night of November 28. The previous record was 402 tons.

Fan Blowers.

The following article has been compiled from the publications of the B. F. Sturtevant Company, Boston, Mass.:

A volume blower is primarily designed to discharge air in large quantity under low pressure with the minimum expenditure of power. This requires a wide and comparatively slow running wheel. A pressure blower, on the other hand, is designed for creating a pressure, as great as 20 oz. per sq. in., while delivering a relatively small volume of air. To this end the wheel must be narrow and operated at high speed. In operation, the peripheral discharge fan sets in motion the air within it, which, by centrifugal force, is delivered tangentially at the outer circumference of the wheel. Air rushes in at the axial inlet to fill the space between the blades, in which there is a tendency to form a vacuum. This vacuum is dependent upon the circumferential speed of the wheel, and the velocity of the air discharged through an outlet of proper size is substantially equal to that of the circumference of the wheel. The fan case thus virtually becomes a reservoir from which the air escapes through the outlet.

In the attempt to force air at a given velocity through a given pipe, it is the province of the fan wheel, if employed therefor, to create within the fan case a total pressure above the atmosphere which shall be sufficient to produce the velocity and also overcome the resistance of the case and the pipe. If, however, the pipe be removed and the fan be allowed to discharge the air through a short and properly shaped outlet, the pressure necessary will, with an efficient fan, be substantially that required to produce the velocity. From the same formulæ, properly transposed, the pressure due to any given velocity or necessary to its creation may be determined. The pressure thus determined is properly that which it is the purpose of the fan, employed as a device for moving air, to create.

The velocity of the fan tips or circumference of the fan wheel which is necessary to produce a given velocity of flow through a properly shaped outlet within the capacity of the fan is substantially equal to the velocity of the flow. If, therefore, the peripheral velocity of a given fan is known, the resulting pressure for the production of velocity through an outlet of proper size and shape may be readily calculated.

In selecting a fan the facts just presented should be borne in mind. It appears to be so simple to secure increased volume by running a given fan at higher speed that the influence upon the power required is frequently overlooked. If the necessary amount of power is actually furnished, its expenditure will entail great loss in efficiency as compared with that required to operate a fan properly proportioned to the work.

In the design of a wheel to meet given requirements it is necessary to make its peripheral speed such as to create the desired pressure, and then to so proportion its width as to provide for the required air volume. Evidently the velocity and corresponding pressure may be obtained either with a small wheel running at high speed or a large wheel running at low speed. But if the diameter of the wheel be taken too small it may be impossible to adopt a width, within reasonable limits, which will permit of the passage of the necessary amount of air under the desired pressure. Under this condition it will be necessary to run the fan at higher speed in order to obtain the desired volume. But this results in raising the pressure above that desired and in unnecessarily increasing the power required. On the other hand, if the wheel be made of excessive diameter it will become more impracticable on account of its narrowness. Between these two extremes a diameter must be intelligently adopted that will give the best proportions for the specific work it is designed to do.

The actual work which a fan may accomplish must depend not only upon its proportions, but upon the conditions of its operation and the resistances which are to be overcome. Evidently it is improper to compare fans when operating under such conditions that these resistances cannot be definitely determined. The simplest and most natural condition of operation is that in which the fan is operated without other resistance than that of the case—that is, with open inlet and outlet. For proper comparison of different fans the areas through which the air is discharged should bear some constant relation to the dimensions of the wheels themselves.

A Quarter Century's Growth in Shipbuilding.

Shipbuilding in the United States is a growing industry, in spite of the discouragement, to which shipbuilders are subjected. In a recent census bulletin it is shown that although the number of establishments engaged in this industry has decreased since 1880 from 2188 to 1097 in 1904, the total capital invested has increased during this period from $20,980,000 to $121,624,000, or 480 per cent. Capital per plant has grown from $9580 to $110,850, or 1056 per cent. The number of employees has increased from 21,345 to 53,234, or 149 per cent., and the employees per yard from 10 to 48, or 380 per cent. The total wages paid have increased somewhat faster than has the number of employees, gaining 156 per cent., or from $12,714,000 to $32,581,000. Wages per man show an increase of 2.7 per cent., from $596 to $612. The annual wages paid out per establishment has increased from $5810 to $29,700, or 412 per cent. The total value of the products, including repair work, has grown from $36,800,000 in 1880 to $82,769,000 in 1904, 125 per cent. The product per establishment shows an increase of 349 per cent., from $16,800 to $75,400. Strange to relate, the product per man has fallen off, having been $1723 in 1880; $1555 in 1890; $1548 in 1900; and again $1555 in 1904. The cost of material used in construction and repair work increased from $19,736,000 in 1880 to $37,463,000 in 1904, or 90 per cent. This is a smaller ratio of gain than that shown for the product, the proportion of materials to product having been 53.6 per cent. in 1880, 41.9 per cent. in 1890, 44.9 per cent. in 1900, and 45.3 per cent. in 1904.

The general tendency has seemed to have been an increase in capitalization far exceeding in extent the concurrent augmentation in value of product, in materials used, or in wages paid. Thus, the value of the product for each $1000 capital was $1754 in 1880, $681 in 1904, a falling off of 61 per cent. In materials used the falling off was from $942 to $308, or 67 per cent. In wages paid the reduction was from $606 to $268, or 56 per cent.

A decision was recently given in the chancery division of the High Court of Justice, London, in the action brought by E. P. Martin and Enoch James of the Dowlais Iron Works, Cardiff, against the Consett Iron Company, Limited, for infringement of a patent on machinery for breaking up beds of pig iron. It developed in the hearing that the difference between the two machines was in the method of operating. The plaintiff's machine broke the pigs by means of four hydraulic rams. The defendant's machine employed eccentrics, toggle links, levers and cams, rotary motion being communicated from a shaft. The court held that as the defendant's machine had nothing in it resembling a plunger and as the patentee's claim was on a steam or hydraulically actuated ram or plunger there was no infringement.

The United States Supreme Court handed down a decision at Washington, December 3, affirming the conviction of the Chattanooga Foundry & Pipe Works, Chattanooga, Tenn., under the Sherman Anti-Trust law, for being a member of the so-called pipe trust, against which a decision was rendered in the Addyston Pipe & Foundry Company case of several years ago. The Chattanooga Company was convicted of charging the city of Atlanta unlawful prices for pipe. The original judgment of $7000 in favor of the city was affirmed.

It is understood that favorable consideration has been given by the officers of the United States Steel Corporation to a proposal to include the common stock in the next stock and bonus offer made to employees of the corporation.

Labor Notes.

The strike at the Clyde shipyards, Great Britain, carried on by the Clyde Boilermakers' and Iron and Steel Shipbuilders' Society, ended on November 16. The ballot of the workers stood 2499 for and 1631 against resuming work. The men went out on October 1 to enforce an advance of 5 per cent. on piece work rates and 1s. 6d. a week on time rates. The shipyard owners had in many cases posted notices of a general lockout and this action largely influenced the calling off of the strike. The men go back under the old terms.

At Chicago last week in the conspiracy trial of Cornelius P. Shea, president of the International Brotherhood of Teamsters, whose strike paralyzed the business of Chicago 18 months ago, a witness testified to the details of a system of graft carried on by the strike leaders. The testimony referred to the distribution of $1500 among Shea and four other labor leaders, who are now under similar charges growing out of the strike.

Manufacturers in metal lines of Fitchburg, Mass., have become deeply interested in the work of the National Metal Trades Association, with the result that membership has been sought by a number of important concerns, and others propose to make their applications. The affiliation will not be through a local branch, but through membership in the Worcester Branch of the National Association. A meeting of the Fitchburg manufacturers with representatives of the Worcester Branch was held at Fitchburg December 1, which was full of enthusiasm and interest. Later on, when the Fitchburg members possess sufficient strength of their own, a Fitchburg branch may be organized, but for the time being it is considered more expedient to affiliate with the members in the neighboring city of Worcester.

The annual meeting of the Springfield Branch of the National Metal Trades' Association was held at Springfield, Mass., November 24, when the following board of officers was elected: President, F. H. Page, Confectioners' Machinery & Mfg. Company, Springfield; vice-president, C. P. Fay, Stevens Duryea Auto Company, Chicopee Falls, Mass.; secretary, F. C. Breakspear, A. G. Spaulding & Bros. Mfg. Company, Chicopee, Mass.; treasurer, Springfield National Bank, Springfield; Executive Committee, R. D. Reed, H. B. Smith Company, Westfield, Mass.; Frederick Felker, Northampton Cutlery Company, Northampton, Mass.; M. W. Bushnell, G. H. Bushnell Press Company, Thompsonville, Conn.; T. J. Rider, J. B. Chapman & Co., Springfield.

The quarterly meeting and dinner of the Cincinnati branch of the National Metal Trades Association will be held Thursday evening, December 6, at Hotel Havlin. S. C. Dickey, president of the Winona Technical Institute, and J. L. Ketchum of the Brown-Ketchum Iron Works, both of Indianapolis, will address the meeting on "Trade Schools and the Training of the Artisan."

The Harris Automatic Press Company, Niles, Ohio, has given its employees a voluntary advance in wages of 10 per cent., effective from December 3.

A meeting of blast furnace operators of the Mahoning and Shenango valleys is to be held in Youngstown, Ohio, to-day, December 6, to take up the matter of an advance in blast furnace labor. Common blast furnace labor is now being paid $1.55 to $1.65 per day, bottom fillers $2.20 and top fillers $2.40. Wages at blast furnaces in the two valleys are not uniform, some employers paying more than others, and an effort will be made at this meeting to adopt a uniform scale.

Secretary of Agriculture Wilson, in his annual report just issued, places the value of the farm products of the year at $6,794,000,000, taken at that point in production at which they acquire commercial value on the farm. This is $485,000,000 above the value of the farm products of 1905, $635,000,000 above 1904 and $2,077,000,000 above the value shown by the census for 1899. Corn is the most valuable crop, being estimated at $1,100,000,000; next comes cotton, while hay is third and wheat is fourth.

The Increase by Decades in Power for Manufacturing.

Census reports on manufactures in the United States include figures showing the development of power employed in these manufactures since 1870. In that year the amount aggregated 2,346,000 hp.; in 1880 the figure was 3,411,000, showing an increase of 45 per cent.; by 1890 the figure had reached 5,955,000, or a further increase of 75 per cent.; in 1900 the total extent was 10,410,000, or an increase of 75 per cent.; in 1904 the aggregate was 14,465,000, or an increase in that short interval of 39 per cent. It may be remarked that this latter increase, if continued, would be a total of 93 per cent. for the decade. Prior to 1890, water and steam were practically the only sources of power. Since then gas and electric power have made enormous advances, amounting during the decade from 1890 to 1900 to about 1400 per cent. for gas, and 1900 per cent. for electric power.

At the present time the report shows that steam, with 10,665,000 hp., accounts for 74 per cent. of the total. Water power, amounting to 1,648,000 hp., represents 11.5 per cent. Electric power accounts for 1,138,000 hp., while the balance is divided between gas, miscellaneous powers and rented power, the details of the original source of the latter not being given.

It may be mentioned that in 1870 water power accounted for almost one-half of the total, and that during the 35 years since that date this source of power has increased only 46 per cent. The proportion to the total represented by steam power had undergone a steady increase until 1890, but has dropped since then.

In November the three blast furnaces of the Carnegie Steel Company at South Sharon, Pa., broke all previous records for daily, weekly and monthly output. For the 24 hours ending November 30 they produced 1600 gross tons, against 1592 tons made November 20. For the week ending November 30 10,232 tons were made. The best previous record was for the weeking ending November 23, 10,150 tons. The total output for November was 40,083 tons, while the best production before that was 40,060 tons made in March of this year.

Though the Dreadnought is not yet completed, the *Engineer* finds that her claim to be the biggest warship in existence is already disallowed. The Terrible, measured by her draft, displaces over 19,000 tons, or 1000 more than the Dreadnought. Drawing over 30 ft. of water, the Terrible recently did 22.3 knots for a period of 4 hr.

A further step in the consolidation of the companies building the McAdoo tunnels under the Hudson River was taken last week, when the Hoboken & Manhattan Railroad Company and the Hudson & Manhattan Railroad Company were consolidated under the name of the Hoboken & Manhattan Company, with a capital stock of $38,500,000.

Two methods of utilizing peat are employed. One is the turning of the peat into briquettes by heating it under pressure to 150 degrees C., or the erection of stations for generating electric energy at the peat deposits, whereby the transport of the peat, or its products, is avoided. An installation of this description is working in Sweden and producing cheap power, and in Denmark similar stations are likely to be erected, when the necessary legal regulations have been provided for the transmission of high tension current.

A considerable lot of cotton ties has been sold recently for shipment to Egypt.

The Citizens' Industrial Association.

Notwithstanding the remarkable progress made in the advancement of the open shop principle during the past year, a more active campaign for industrial freedom was mapped out at the fourth annual convention of the Citizens' Industrial Association of America, held at the Auditorium, Chicago, December 3 and 4. The interest manifested in the meeting is indicated by the attendance of delegates from England and Canada, who are in full sympathy with the movement, as well as more than 100 delegates from 469 national, State, and local associations in the United States. The national organizations represented are as follows: National Association of Manufacturers, National Metal Trades Association, National Founders' Association, National Typothetæ, American Anti-Boycott Association, National Association of Master Painters and Decorators, National Erectors' Association and National Merchant Tailors' Association.

The convention was called to order on Monday morning with President C. W. Post in the chair, and after invocation by Rev. William A. Quayle, and the words of welcome by Dr. Howard Taylor, representing Mayor Edward F. Dunne of Chicago, the presidential address was delivered, which is presented herewith in part:

No year in the history of the United States has marked the progress made in industrial freedom and return of the control of affairs to the hands of the American people as the 12 months from December 1, 1905, to December 1, 1906, and one of the most potent factors in this work has been the Citizens' Industrial Association of America, with its allied branches, in some 500 cities in America. This association does not exist for the purpose of destroying trusts but for defending citizens and communities from the destructive acts of trusts both of capital and labor. The trusts operate with the power of organization, and this power must be met with similar organization on the part of the people, otherwise they are helpless. The greatest trust with which the people have had to contend has been the labor trust, technically known as the American Federation of Labor, with its allied local organizations, comprising, perhaps, 1,500,000 to 2,000,000 men.

The term "open shop" is used to define an industrial institution open to the employment of workingmen without regard to a membership in any church, secret order or labor union. The "closed shop" is a place of employment closed to all free workmen who do not choose to place themselves under the control of the labor trust. The closed-shop owner agrees to buy his labor of the labor trust alone, and prevent any other workman from securing employment in that institution. Experience has shown that the employers who have committed this grievous sin against the liberties of the American workingmen have suffered as they deserved in practically all such cases, and perhaps much more than they deserve in many. A wrong against principle will sink deeper until the hurt is great enough to demand reformation.

We are enjoying a period of unprecedented prosperity; but the old law of the fat years and of the lean years must not be forgotten, and it is the part of the wise man or the wise nation to store up all the corn in the bins during the fat years in order to comfortably live through the succeeding lean years sure to follow. Therefore, any man or set of men, whether they represent capital or whether they represent labor, interfering with the wise policy of storing all of the material wealth possible during the years of prosperity, becomes a public enemy and should be treated as such, and it is the duty of every patriotic citizen, having the interest of his fellow-man at heart, to devote himself to securing the punishment of such enemies.

We seem to be slowly approaching a period of peace in industrial affairs—a period like that following a war between nations wherein both have acquired a very wholesome respect for one another. The strife was intense between the employers and employees, but the interposition of the third and by far the greatest and most powerful party, the citizens, with the demand for the open shop, no restriction as to number of apprentices, no boycott, no violence, no picketing, and steady operation of industries, has marked a long step toward permanent industrial peace.

The report of Secretary James A. Emery dealt with the work accomplished by his office during the year. After the appointment of committees the session was declared adjourned. An able paper on the "Sherman Anti-trust Law and Its Application to Illegal Labor Combinations" was read during the afternoon session by Hon. T. J. Mahoney. W. Collison, general secretary of the Free Labor Association of Great Britain and the Citizens' Industrial Association of Great Britain, discussed the rise of the English free labor movement, and presented facts and figures indicative of the progress that is being made in England in freeing its industries from the domination of union labor. Resolutions were adopted, as follows:

Whereas, The operations of the labor trust have reached a point in extent and influence where they are a serious injury and increasing menace to the industries of our country, and to the general public welfare; and

Whereas, Many of these operations are not only unlawful and criminal at the common law, but are within the prohibition of the Sherman antitrust act, according to the true spirit and intent, and also are within the prohibition of the statutes of many of our States; be it

Resolved, That the Citizens' Industrial Association of America, heartily approving the past activity of national and State administrative officers in the enforcement of antitrust and anti-conspiracy laws, again, in convention assembled, in the name of justice and fair play, and voicing an aroused and intelligent public sentiment, asks for the enforcement of those laws as well against combinations of labor as against combinations of capital, as enemies of similar character and equally dangerous to the interests of the common people; and be it further

Resolved, That it is the duty of every member of the association and of every public-spirited citizen to use every effort to collect evidence of unlawful conduct on the part of the labor trust and furnish the same to the public prosecutor, and to demand with all the force and influence at his command the institution and prosecution of appropriate legal proceedings.

Difficulties experienced in building operations with union labor were ably presented by Walter Drew, commissioner of the National Erectors' Association, in an address on the "Open Shop in the Building Trades."

On Tuesday morning J. W. VanCleave, president of the National Association of Manufacturers, in discussing "The Citizens' Industrial Movement from a Manufacturers' Standpoint," suggested the establishment of a manual training department in every public school, to afford male students an opportunity of learning the different trades, which is now denied them by the labor unions, through the enforcement of unreasonable apprenticeship ratios. Resolutions were adopted indorsing the efforts that are being made in various cities for the establishment of trade schools, and their incorporation as a part of the public school system was urged. The enforcement of existing child labor laws was recommended, and where they prove inadequate the passage of stringent laws was suggested to correct child labor abuses. The next meeting will be held in Battle Creek, Mich., the home of the president of the association. Officers were elected as follows:

C. W. Post, Battle Creek, Mich., president; J. W. Van Cleave, St. Louis, first vice-president; F. C. Nunemacher, Louisville, second vice president; A. C. Marshall, Dayton, Ohio, third vice-president; James A. Emery, secretary; Major A. C. Rosencranz, Evansville, Ind., treasurer. Executive Committee—John Kirby, Jr., Dayton, Ohio; Geo. B. Hugo, Boston; Euclid Neartin, Omaha; Fred. W. Job, Chicago; C. H. Smith, Aurora, Ill.; T. J. Mahoney, Omaha; Geo. P. Bent, Chicago; Col. T. H. Brown, Sioux Falls, South Dakota, and J. W. Kranz, Peoria, Ill.

The Pig Iron Import Movement.—Latest British estimates of the pig iron and pig iron warrant purchases in England and Scotch markets on American account put the figure at 200,000 tons. It is stated that demand from Germany has increased along side of that from the United States, which includes not only Cleveland and Scotch foundry irons, but hematite or Bessemer iron from both East Coast and West Coast makers. It is expected in the British iron trade that the American demand will continue steadily through the winter. The one drawback is the inability to ship as promptly as buyers on this side desire. One market report states that British puddled bars are also being exported to the United States. In the market week ending November 23, Cleveland warrants advanced from 57s. 3½d. to 59s. 9d., while No. 3 Cleveland iron advanced from 57s. 6d. to 60s. Warrant stocks in Connal's stores, Middlesbrough, England, were 537,803 tons on November 21, a decrease of 19,745 tons since November 1. The quantity exported last month to November 21 was 91,537 tons, as compared with 85,268 tons in October; 58,250 tons in November, 1905; and 50,085 tons in November, 1904, all to November 21.

The William Cramp & Sons Ship & Engine Building Company, Philadelphia, launched the Antilles December 3, being the last of the recently completed trio of passenger and freight steamships building for the Southern Pacific Company, to engage in the New York and New Orleans trade.

NEWS OF THE WORKS.

Iron and Steel.

It has been found that No. 3 furnace of the Carnegie Steel Company, at Duquesne, Pa., which was blown out last week for repairs, will have to be entirely relined, as the sides started to fall as soon as the furnace began to cool. It will not be blown in before February 1.

The Lorain Steel Company has completed plans for enlarging its plant at Johnstown, Pa. About $100,000 will be expended for machinery and $250,000 for new buildings.

The West End Rolling Mill Company, Lebanon, Pa., has elected Christian Shenk president; John R. Evans, secretary, and Harry P. Moyer, treasurer.

The Seyfert rolling mill, at Gibraltar, near Reading, Pa., has been started after an idleness of several weeks.

The Reading Iron Company last week started several of its furnaces in the mills at Reading, Pa.

The furnace of the Hudson Iron Company at Secaucus, N. J., was put in blast on November 10 after being out for a number of months for extensive improvements. A new hoist was installed, also two vertical boilers of the Wheeler type and one Meehan boiler. An additional blowing engine of the Cuyahoga type was furnished by the American Shipbuilding Company, Cleveland, Ohio. The furnace has been working very satisfactorily, making a good product of foundry iron from a mixture containing Mesaba ore, magnetite from the Hudson Iron Company's mine at Fort Montgomery, N. Y., where it operates the old Forest of Dean, and limonite from its open pit mine at Beatyestown, N. J.

The new Haselton, Ohio, furnace of the Republic Iron & Steel Company has already reached an output of 500 tons in 24 hrs.

General Machinery.

The Crescent Forgings Company, Hulton, Pa., is making some additions to its plant and is adding a 600 and a 1000 lb. drop hammer to its equipment.

The Hard Mfg. Company, Black Rock Station, Buffalo, N. Y., is in the market for a second-hand milling machine.

The Buffalo Forge Company, Buffalo, N. Y., has closed a contract with the Illinois Steel Company to furnish two of its centrifugal water spray gas cleansing fans, with cast iron housings, to be used in the plant at Bay View, Wis.

The Youngstown Sheet & Tube Company has placed an order with the Wellman-Seaver-Morgan Company, Cleveland, for a duplicate charging machine to serve two heating furnaces in the skelp department.

Power Plant Equipment.

The Indianapolis, Crawfordsville & Western Traction Company, Crawfordsville, Ind., has placed contracts for its power generating and electrical equipment with the Allis-Chalmers Company, Milwaukee, as follows: For its main stations, two 20 and 42 in. Reynolds horizontal cross compound Corliss engines, two 700-kw. Allis-Chalmers generators, six 250-kw. transformers, 50-kw. motor generator set, three 300-kw. rotary converters, nine 110-kw. transformers, ten Allis-Chalmers 75-hp. railroad motor equipments and ten air brake equipments. Other sales include the Inland Steel Company, Indiana Harbor, Ind., equipment for new blast furnace plant, including two 44 and 84 x 60 in. high pressure vertical long crosshead blowing engines, two 20 and 42 x 42 in. Reynolds heavy duty cross compound Corliss engines direct connected to two 550-kw. Allis-Chalmers generators; Cleveland Cliffs Iron Company, Ishpeming, Mich., 14 x 24 in. Reynolds duplex Corliss hoisting engine; South Baltimore Steel Car & Foundry Company, Baltimore, Md., 22 x 48 in. Reynolds heavy duty Corliss engine, 250-kw. generator and exciter.

The Buffalo Steam Pump Company, Buffalo, N. Y., which recently increased its capital stock from $1,000,000 to $1,250,000 to provide enlarged facilities and enable it to care for its constantly increasing trade for home and export shipment, has a great number of export orders now in hand, including a large order for duplex power pumps for A. D. Wadia & Co., Ahmedabad, India; 4-in. class B centrifugal pumps, electric driven, for Gomer-Karsha, Yokohama, Japan; one complete set of centrifugal pumps up to 7 in. in size for S. Sykes & Co., Johannesburg, South Africa, and three 7 x 10 x 12 in. single cylinder air pumps and jet condensers for S. Zoliner, Sidney, Australia; also many domestic orders, including two 30-in. centrifugal pumps for the Toledo Ship Building Company; two 14-in. two-stage turbine pumps for direct connection to Allis-Chalmers Bullock motors for 200 ft. head, for the Toledo Gas, Electric & Heating Company; one 10-in. class A double suction horizontal centrifugal pump, to be used for raising water for condensers from the Ohio River by the Cincinnati Traction Company, mounted on car running on bank to follow level of water, and one 10-in. single suction centrifugal pump for Albaro Carrizose, Botoya, Col., for irrigation purposes.

The Pittsburg Coal Company has awarded a contract to the Monongahela Saw & Planing Mill Company for the erection of a power plant for the Crescent and Vigilant mines, near California, Pa. Machinery will be installed to generate electricity for the operation of both mines, and as soon as the plant is completed work will be started on the construction of a steel tipple at the Vigilant mine.

The Clearfield Electric Light & Power Company, Clearfield, Pa., whose plant was recently burned, is to rebuild, doubling the former capacity. The company will require pipe fittings, heater, separator, switchboard and other apparatus.

The Harrisburg Foundry & Machine Works, Harrisburg, Pa., has booked an order for a 400-hp. four-valve engine for the new building of the New York Life Insurance Company at Chicago. A similar order has also been taken for a large hotel at Pasadena, Cal.

The Roanoke Rapids Power Company is to construct a hydraulic power plant at Roanoke Rapids, N. C. A 2000-ft. dam will be constructed across the Roanoke River and a power house will be erected in which machinery for developing 1000 hp. will be installed at first. Additional units will be installed as the power is needed. W. M. Habliston, president of the National Bank of Virginia, Richmond, is president of the power company.

The Fairbanks-Morse Electric Mfg. Company, Indianapolis, Ind., has built a factory designed especially for the manufacture of dynamos and motors. The company is affiliated with Fairbanks, Morse & Co., Chicago. This firm took on a new line of induction motors last July, but was unable to manufacture them in its electric plant at Three Rivers, Mich., on account of the large volume of direct current work which it there had in hand. The Indianapolis factory will place on the market standard EE type dynamos and motors for direct current lighting and power; standard E type motors, open or semiinclosed; standard E type direct current dynamos; special motors, such as single belt reversing elevator motors, back geared motors, inclosed and semiinclosed type motors, buffing lathe motors and motor generators, induction motor starting devices, alternating current B type constant speed induction motors, engine type generators, gas and gasoline engines for electric light and power plants. Special bulletins have been issued illustrating and describing these various devices.

The N. C. Davison Mfg. Company, manufacturers' agent, Empire Building, Pittsburgh, has recently received orders for a 50 ton ice plant for the Hinton Ice Company, Hinton, W. Va.; a 250 electric light plant with gas engine equipment, for Joseph Horton, Braddock, Pa.; a 50-hp. Bessemer gas engine for the United Engineering & Foundry Company, Pittsburgh, and a 40-hp. Bessemer gas engine for the Thompson Milling Company, West Washington, Pa.

The report that the Westinghouse Electric & Mfg. Company had bought a large site of land at Seattle, Wash., upon which it would build a large plant is authoritatively denied. The company states that it has not bought any property at Seattle or elsewhere for the building of new works.

The Pittsburgh Railways Company has placed a contract with the Westinghouse Machine Company, East Pittsburgh, for a battery of Roney stokers, to be installed in the Brunot's Island power plant in Pittsburgh.

The Pittsburgh Reduction Company has placed a contract with the Murphy Iron Works, Empire Building, Pittsburgh, for stokers for 10,000-hp. boiler capacity; also an order with the Babcock & Wilcox Company for 12,000-hp. water tube boilers. All this equipment is to be installed in its plant at New Kensington, Pa.

Foundries.

The Wambold-Brunschweiler Company, brass founder, has been incorporated at Milwaukee with a capital stock of $30,000. A year ago the business was started by H. E. Wambold in leased quarters at 270 Fourth street, and the company has incorporated for the purpose of extending its business. H. E. Wambold is president; Orrin Thompson, vice-president, and Geo. W. Brunschweiler, secretary.

The Hewitt Mfg. Company, which for many years has conducted a brass foundry at Milwaukee, has been incorporated with a capital stock of $100,000. The incorporators are Chas. H. Duback, Chas. Schoff and William Liebau. The president of the company will be C. M. Hewitt, who organized the business and has been identified with it for many years. The company makes a specialty of the manufacture of brass journal bearings for railroads, brass and bronze locomotive castings and does a general line of foundry business in brass and bronze. The plant is located at 241 Greenfield avenue.

The Sunset Iron Works, Los Angeles, Cal., owned by K. Wetzell, will erect a new foundry and ornamental iron department, 100 x 150 ft. The plant will be modern in every respect and the product will be castings and high class ornamental ironwork.

The Franklin Moore Company, Winsted, Conn., will commence operations in its new foundry this week, producing light gray iron and small brass castings.

The Sheffield Casting & Mfg. Company, Sheffield, Ala., has incorporated with a capital of $50,000 to erect and operate a general foundry and machine shop. D. I. Miller is president; John Dork, Jr., vice-president, and E. G. Moss, secretary.

Records for the two months ending November 30 show that all totals for production at the Pittsburgh, Alliance and Sharon

plants of the American Steel Foundries have been broken for that period.

The Chickasaw Iron Works, Memphis, Tenn., has purchased a 5-acre site in North Memphis for $7500 and will erect a branch of its well established business at a cost of about $40,000. According to the present plans, three iron buildings, 75 x 150 ft., will be erected, including a foundry, structural shop and power house.

The Westinghouse Air Brake Company, Pittsburgh, is making some large extensions to its plant at Wilmerding, Pa. There is under construction at the machine foundry a two-story building 50 x 125 ft., the first floor of which will be used as a washroom and coatroom, and the second as a coreroom. The building is of brick, steel and concrete, and is being erected to secure better ventilation in the cleaning room, to provide a coreroom better suited for the work and to include sanitary arrangements. At the floor foundry a brick and steel building 35 x 93 ft. is under way, and will be used as a coat and washroom.

The Florence Iron Works, Florence, N. J., contemplates making improvements to that part of its foundry used for making 4 and 6 in. pipe, to enable it to make more and larger pipe than it produces at present. It is the intention to do away with hydraulic cranes and use electric cranes. Changes are also to be made in the gas producer plant by putting in new producers and moving them nearer the coal trestle. These improvements will be made as early in the spring as the weather will permit.

Bridges and Buildings.

The Bartlett Steel Company, Joplin, Mo., has been awarded the contract for the fabrication and erection of all the steel buildings required in the new $1,000,000 cement plant of the Dewey Portland Cement Company, Dewey, I. T., which is now being constructed by Tyler & Co., Junction City, Kan. This work of erection will commence in less than 90 days, and it is expected that it will be completed in the early part of May. The construction involves about 500 tons of structural material.

Fires.

The electric light plant at Cooper, Texas, owned by J. W. Hockady, was burned last week, the loss being about $10,000.

The power house of the Swift Packing Company, at East St. Louis, Ill., was damaged $25,000 by fire November 26.

The plant of the Gorman Electric Company, St. Paul, Minn., was destroyed by fire November 29, the loss being about $10,000.

The Hygeia Brewing & Artificial Ice Company's plant at Passaic, N. J., was burned December 2, entailing a loss of $100,000.

The tin specialty plant at Follansbee, Pa., owned by the Follansbee Bros. Company, Pittsburgh, was destroyed by fire November 30. The loss is about $28,000.

Hardware.

The Escoba Mfg. & Supply Company, 147-149 Cedar street, New York, has recently built a factory in Brooklyn equipped with modern machinery to manufacture push brooms of all kinds on a much larger scale than heretofore attempted by the company. It is intimated that the company is prepared to furnish the goods at attractive prices.

Owing to the rapid growth of its business the Ward Fence Company, Marion, Ind., which recently completed a new plant at that place, has decided to make further extension in the immediate future consisting of a building 60 x 400 ft. The company removed its plant from Portland, Ind., on September 15, its present plant being 80 x 250 ft. Particular attention is given to the manufacture of ornamental wire fabric, lawn and many different styles of heavy wrought iron and steel picket fences. A special line of heavy steel farm gates is also made.

The Nettleton Mfg. Company, Middletown, Conn., manufacturer of hardware specialties, has increased its capital stock from $5000 to $50,000.

At a meeting of the directors of the Penn Shovel Mfg. Company, Warren, Ohio, held on the 20th ult., it was voted to increase the number of directors by five. The new members of the board are P. P. N. Dwyer, Clay Hanna, C. W. Young, Chas. A. Day and Wm. Wilkoff.

The Bridgeport Wood Finishing Company, New Milford, Conn., manufacturer of silex, paints, varnishes, japans, &c., has increased its capital stock from $250,000 to $400,000. The business has been expanding rapidly during the past few years and it has been found necessary to largely increase the capital in order to handle the trade.

James B. Sipe & Co., manufacturers of Sipe's japan oils, with office at 400 Federal street, Allegheny, are erecting a new plant about 10 miles from Pittsburgh proper. It will comprise 13 buildings in all, constructed of concrete and conduit tile.

Miscellaneous.

The Youngstown Furnace & Supply Company, Youngstown, Ohio, manufacturer of the Lion combination furnace and the Apex furnace, is negotiating with the Board of Trade of Warren, Ohio, with a view of removing its plant to that place. In case the Warren Board of Trade subscribes $10,000 toward securing the plant it will be moved to that place and built on a larger scale than at present.

Owing to the unusually large number of orders on the books of the Driggs-Seabury Ordnance Company at the plant at Sharon, the entire plant has been placed on double turn.

The Hadley-Smith Mfg. Company, East Haddam, Conn., has been organized to manufacture belt and suspender buckles and novelties and will begin production in April or May of next year. The company has a capital stock of $20,000. The incorporators are E. W. Hadley and Reuben W. Hadley, New Britain; George M. Smith, Derby, and Charles M. Emily, Moodus, Conn.

The Pairpont Mfg. Company, New Bedford, Mass., is to erect a new paper mill of reinforced concrete, one story, 88 x 249 ft., with extension 58 x 74 ft.

The Haines Oil Measuring Pumping Company, York, Pa., has completed plans for a three-story and basement brick plant, 45 x 100 ft., which will be of mill construction and will be used for the manufacture of oil pumps and tanks.

The directors of the Pressed Steel Pole Company held a meeting last week at the offices at Scottdale, Pa., and filled a vacancy in the board by the election of M. A. King. The office of treasurer was also filled by the election of G. E. Mullin. The company has a large plant in the East End which is about completed, and an official advises that it will be placed in operation about December 20. Pressed steel poles for use on street railroad systems will be manufactured.

The Century Telephone Construction Company, Buffalo, N. Y., has purchased the telephone manufacturing business of the Williams-Abbott Electric Company, Cleveland, and will move the plant of the latter company to Buffalo, where it will be consolidated with the Century Company's recently acquired plant on the New York Central Belt Line at Elmwood avenue, which was purchased from the General Railway Signal Company.

The Cutler-Hammer Mfg. Company, Milwaukee, Wis., manufacturer of electric motor controlling devices, has purchased property on St. Paul avenue and Twelfth street, opposite its present plant. The property has a frontage of 30 ft. on St. Paul avenue and is said to have been purchased with a view to future additions to its plant.

The Thomas Strahan Company, Chelsea, Mass., is to build a new factory, three stories and between 300 and 400 ft. long, for the manufacture of wall paper.

The United States Envelope Company has purchased a large tract of land at Springfield and proposes to erect a large factory on the premises, which it is said will contain over 100,000 sq. ft. of floor area.

The H. W. Johns-Manville Company, manufacturer of asbestos and magnesia products, is making arrangements for extensive improvements to its plant at Wauwatosa, Wis., a suburb of Milwaukee. They will consist of a refining building, roofing factory and an addition to the paper mill. The buildings will be of brick and steel construction.

Cassier's Magazine has been sold by the estate of the late Louis Cassier to Henry Harrison Suplee, for many years the technical editor of the *Engineering Magazine*, and James Van Vorst Colwell, recently works manager for the C. W. Hunt Company, and the publication will be continued as heretofore by the Cassier Magazine Company, 3 West Twenty-ninth street, New York. The editorial conduct of the magazine will be in the hands of Mr. Suplee, who brings to this work a wide experience, both in the practice of mechanical engineering and of technical journalism, while the business department will be directed by Mr. Colwell. The first issue of the magazine under the new management will be the January number.

The Association of American Portland Cement Manufacturers will hold its fourth annual meeting in the Hotel Astor, Forty-fifth street and Broadway, New York City, December 10-12, 1906. The annual dinner will be held on the evening of December 11, at 7.30.

The Boston office of the Schutte & Koerting Company, Philadelphia, has closed an order from the Boston Elevated Railway Company for 73 Schutte extra heavy automatic stop and check valves for its different power plants in Boston, making a total of 50 valves of the type which the company is using.

The Iron and Metal Trades

The markets are firm, quite active, and a number of further advances have been recorded. These include $2 per ton on the whole line of Wire products, making the basis 2c., Pittsburgh, $3 per ton on Angle Bars, $2 per ton on Merchant Pipe and from $1 to $2 on Cast Iron Pipe. The leading Eastern Plate manufacturers have again made an advance of $2 per ton, bringing the price up to the basis of 1.80c., Pittsburgh. The Western mills have not yet followed suit, however.

The Pig Iron markets in England have been growing excited, and an advance has been scored to 80½ to 81 shillings for Scotch and 63 shillings for No. 3 Middlesbrough. Further sales of foreign Foundry Iron in this market have been made, and one inquiry has been received for 10,000 tons of Foundry and Malleable Iron from an agricultural implement interest, which, however, will apply the greater part of the tonnage to export work. In the Chicago District a Car Wheel interest has purchased 15,000 tons of Malleable Iron for the second half of 1907, on the basis of $22.50, Chicago. In the East some further sales of Basic Pig aggregating 7000 to 8000 tons have been made for delivery up to the second quarter. In the Birmingham District two furnaces have been banked in order to accumulate raw material and work off Iron in the yards, which lack of cars has made it impossible to ship.

The scarcity of Pig Iron is more pronounced than ever and threatens to cause the closing down of important mills.

The Southern railroads have announced an advance in rates of 25 cents per ton from Birmingham to points north of the Ohio River. Some of the railroads make this effective on January 1, and others on February 1.

In spite of the congested condition of the rail mills a fair volume of new business is being booked. The largest of these is a lot of 12,500 tons for the Shasta Southern.

The American Bridge Company took 50,000 tons of work in November and has since added 5000 tons for the Philadelphia Rapid Transit. The New York Central is beginning to give out orders for the material for a series of stations. Originally this was estimated at a total of 40,000 tons, but the work may extend over a considerable period. An extension for the Brooklyn Heights Company will call for from 5000 to 7000 tons.

Plate makers are full of work. An Eastern mill has just taken orders in the Chicago District aggregating 8000 tons.

The Merchant Pipe mills are figuring on a large business. There are now coming up three additional oil lines from the Indian Territory fields to the Gulf, each of which will call for upward of 400 miles of Pipe.

The manufacturers of Cast Iron Pipe are exceedingly busy. Among the largest lettings coming up is one for New Orleans toward the end of January which will call for about 38,000 tons.

There has been a heavy movement in Steel Melting Scrap. Three Eastern Steel works have bought together about 30,000 tons at $19.50 and better, while a Sharon plant has purchased from 12,000 to 15,000 tons at $20.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	Dec. 5, 1906.	Nov. 28, 1906.	Nov. 7, 1906.	Dec. 6, 1905.
PIG IRON, Per Gross Ton:				
Foundry No. 2, Standard, Philadelphia	**$24.50**	$24.00	$22.75	$18.25
Foundry No. 2, Southern, Cincinnati	**25.00**	25.00	23.00	16.75
Foundry No. 2, Local, Chicago	**25.50**	25.50	24.50	19.25
Bessemer, Pittsburgh	**23.35**	23.35	22.85	18.35
Gray Forge, Pittsburgh	22.85	22.85	22.85	17.10
Lake Superior Charcoal, Chicago	**26.00**	26.00	23.50	20.00
BILLETS, &c., Per Gross Ton:				
Bessemer Billets, Pittsburgh	**29.50**	29.50	28.50	26.00
Forging Billets, Pittsburgh	**36.50**	36.50	36.00	30.00
Open Hearth Billets, Phila	*33.00*	33.00	34.00	30.00
Wire Rods, Pittsburgh	**37.00**	37.00	35.00	32.50
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00
OLD MATERIAL, Per Gross Ton:				
O. Steel Rails, Chicago	**20.50**	20.50	20.00	16.50
O. Steel Rails, Philadelphia	**20.00**	20.00	18.75	18.25
O. Iron Rails, Chicago	28.00	28.00	28.00	23.00
O. Iron Rails, Philadelphia	**27.50**	27.50	25.50	24.50
O. Car Wheels, Chicago	**24.50**	24.00	21.50	18.00
O. Car Wheels, Philadelph'a	**23.00**	23.00	21.50	17.50
Heavy Steel Scrap, Pittsburgh	**20.00**	20.00	16.75	18.00
Heavy Steel Scrap, Chicago	17.50	17.50	17.50	15.25
FINISHED IRON AND STEEL, Per Pound:	Cents.	Cents.	Cents.	Cents.
Refined Iron Bars, Philadelphia	1.83½	1.83½	1.83½	1.83½
Common Iron Bars, Chicago	1.71½	1.71½	1.71½	1.85
Common Iron Bars, Pittsburgh	1.80	1.80	1.80	1.90
Steel Bars, Tidewater, New York	**1.74½**	1.74½	1.64½	1.64½
Steel Bars, Pittsburgh	**1.60**	1.60	1.50	1.50
Tank Plates, Tidewater, New York	**1.84½**	1.84½	1.74½	1.74½
Tank Plates, Pittsburgh	**1.70**	1.70	1.60	1.60
Beams, Tidewater, New York	1.84½	1.84½	1.84½	1.84½
Beams, Pittsburgh	1.70	1.70	1.70	1.70
Angles, Tidewater, New York	1.84½	1.84½	1.84½	1.84½
Angles, Pittsburgh	1.70	1.70	1.70	1.70
Skelp, Grooved Steel, Pittsburgh	**1.65**	1.65	1.57½	1.55
Skelp, Sheared Steel, Pittsburgh	**1.70**	1.70	1.60	1.65
SHEETS, NAILS AND WIRE, Per Pound:	Cents.	Cents.	Cents.	Cents.
Sheets, No. 27, Pittsburgh	2.50	2.50	2.50	2.20
Wire Nails, Pittsburgh	**2.00**	1.90	1.85	1.80
Cut Nails, Pittsburgh	**2.05**	1.95	1.90	1.70
Barb Wire, Galv., Pittsburgh	**2.45**	2.35	2.30	2.25
METALS, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake Copper, New York	**22.75**	22.75	22.50	18.00
Spelter, St. Louis	**6.35**	6.30	6.20	6.40
Lead, New York	**6.05**	6.00	5.90	5.90
Lead, St. Louis	*5.87½*	5.87½	5.90	5.75
Tin, New York	*42.45*	43.40	42.50	35.10
Antimony, Hallett, New York	25.00	25.00	25.00	13.00
Nickel, New York	45.00	45.00	45.00	40.00
Tin Plate, Domestic, Bessemer, 100 lb., New York	$4.09	$4.09	$4.09	$3.59

Chicago.

FISHER BUILDING, December 5, 1906.—(*By Telegraph.*)

An advance of 25c. a ton in Pig Iron freight rates on shipments from furnaces in the Birmingham District has been announced by the railroads operating south of the Ohio River. The Norfolk & Western's revised schedule will go into effect January 1, while the remainder of the Southern roads will not make the change until February 1. The increased cost of transportation will be borne by the consumers, inasmuch as the shippers provided against this emergency in their contracts which provide that the buyers must bear increased transportation charges, but on the other hand they derive benefits accruing from any reduction in rates. This action has aroused considerable feeling owing to the poor facilities afforded by the railroads for the past three months, and the increased tariff will have to be paid on the large tonnage of unshipped Iron which would otherwise have been delivered but for the failure of the car supply. Although steps are being taken to prevent the application of the advance on the undelivered tonnage of the fourth quarter, it is doubtful if this demand will be met. Further purchases of foreign Pig Iron have been made by the International Harvester Company, the total now under contract aggregating 13,000 tons, and negotiations are pending for another cargo.

A large Car Wheel manufacturer placed an order for 15,000 tons of Malleable Bessemer for last half delivery at approximately $22.50, Chicago, but this purchase does not reflect the attitude of consumers, inasmuch as the Iron was secured to cover a contract for Wheels reported to have been based on this quotation. There is a pronounced tendency among consumers to defer action on future requirements, owing to the high level of values, and the indica-

tions are that transactions will be limited to spot requirements until more attractive prices prevail. All of the Western Plate manufacturers, with the exception of the Steel Corporation subsidiaries, are uniformly quoting on the basis of 1.70c. Pittsburgh, while some Eastern mills are asking 1.80c. Cast Iron Pipe makers have made advances ranging from $1 to $2 a ton, and they report that action on 1907 tonnage is being generally deferred, as the present prices are considered abnormally high. Bar Iron is more active, an inquiry for 7000 tons now being figured on.

Pig Iron.—Shipments from Southern furnaces have shown no material improvement during the week and in consequence there has been no decline in the demand for spot Iron. Standard grades of No. 2 in transit are selling on the basis of $23, Birmingham, although occasional car lots are offered at $22. For shipments through the first quarter $21.50 is the minimum, while $22 is generally asked, making the Chicago delivered price $26.15. For second quarter requirements $23.15, Chicago, is asked, but there have been no sales on this basis since the announcement of the advance in freight rates. Roads north of the Ohio River are not expected to make any change in their schedules, although nothing definite on this can be learned at this time. The sale of 15,000 tons of Malleable Bessemer for the last half of next year at approximately $22.50 is the only basis from which computation can be made of the values of other Northern grades for that period, and for the second quarter Malleable interests have been asked $24 to $25. Southern Iron quotations given below are based on the new freight rates for shipment through the first quarter of the year. Quotations, f.o.b. Chicago, are as follows:

Lake Superior Charcoal	$26.00 to $26.50
Northern Coke Foundry, No. 1	26.00 to 26.50
Northern Coke Foundry, No. 2	25.50 to 26.00
Northern Coke Foundry, No. 3	25.50 to 26.00
Northern Scotch, No. 1	26.00 to 27.00
Ohio Strong Softeners, No. 1	26.00 to 26.50
Ohio Strong Softeners, No. 2	25.50 to 26.00
Southern Coke, No. 1	25.65 to 26.15
Southern Coke, No. 2	25.15 to 25.65
Southern Coke, No. 3	24.65 to 25.15
Southern Coke, No. 4	24.15 to 24.65
Southern Coke, No. 1 Soft	25.65 to 26.15
Southern Coke, No. 2 Soft	25.15 to 25.65
Southern Gray Forge	23.15 to 23.65
Southern Mottled	22.65 to 23.15
Malleable Bessemer	26.00 to 26.50
Standard Bessemer	25.30 to 25.80
Jackson Co. and Kentucky Silvery, 6 %	27.30 to 27.80
Jackson Co. and Kentucky Silvery, 8 %	29.30 to 29.80
Jackson Co. and Kentucky Silvery, 10 %	31.30 to 31.80

Metals.—Advances have again been recorded in Copper and Spelter, and still higher prices are expected to prevail for the latter in the near future. The market is active, notwithstanding the season. We quote: Casting Copper, 24c. to 24½c.; Lake, 24½c. to 24⅝c., in car lots for prompt shipment; small lots, ¼c. to ⅜c. higher; Pig Tin, car lots, 45½c.; small lots, 45¾c.; Lead, Desilverized, 6.05c. to 6.15c., for 50-ton lots; Corroding, 6.75c. to 6.85c., for 50-ton lots; on car lots, 2¼c. per 100 lb. higher; Spelter, 6.65c.; Cookson's Antimony, 28½c., and other grades, 26½c. to 27½c.; Sheet Zinc is $8 list, f.o.b. La Salle, in car lots of 600-lb. casks. On Old Metals we quote: Copper Wire, 18¾c.; Heavy Copper, 18¼c.; Copper Bottoms, 17¾c.; Copper Clips, 18c.; Red Brass, 18c.; Red Brass Borings, 14¾c.; Yellow Brass, 14¼c.; Yellow Brass Borings, 12¾c.; Light Brass, 11¼c.; Lead Pipe, 5.40c.; Tea Lead, 5c.; Zinc, 5c.; Pewter, No. 1, 26c.; Tin Foil, 34c.; Block Tin Pipe, 27½c.

(By Mail.)

Billets and Rods.—The demand for Forging Billets has temporarily subsided, as the prices asked by the mills are almost prohibitive. A small tonnage of Southern Billets has been offered in this market recently, but no sales have been reported. Bessemer and Open Hearth Rods are firm at $38, Chicago, and the tonnage available is limited. Asking prices of Forging Billets range from $38 to $42, according to quality.

Rails and Track Supplies.—With practically all the Western roads covered on Standard Sections through 1907, there is little new tonnage available, and most of the offerings are being booked by the Carnegie Steel Company, as the Illinois Steel Company is sold up through the first 10 months of the year. The demand for Light Rails has also subsided, although the railroads are eagerly placing orders with the mills for Supplies. Quotations are unchanged as follows: Angle Bars, accompanying Rail orders, 1906 delivery, 1.50c.; carload lots, 1.75c.; Spikes, 2.25c. to 2.50c., acording to delivery; Track Bolts, 2.65c. to 2.75c., base, Square Nuts, and 2.80c. to 2.90c., base, Hexagon Nuts. The store prices on Track Supplies range from 0.15c. to 0.20c. above mill prices. Light Rails, 30 to 45 lb. sections, $32; 25-lb., $33; 20-lb., $34; 16-lb., $35; 12-lb., $36, f.o.b. mill. Standard Sections, $28, f.o.b. mill, full freight to destination.

Structural Material.—An avalanche of small orders was booked by local fabricators during the week, making up a round tonnage in the aggregate. Specifications have been received for furnishing the Steel for the Chicago & Milwaukee Electric Railway Company's power station at Waukegan, amounting to 2500 tons. There is a fair movement of material from local warehouses on the basis of 2.05c. to 2.10c. Mill quotations are as follows: Beams and Channels, 3 to 15 in., inclusive, 1.86½c.; Angles, 3 to 6 in., ¼-in. and heavier, 1.86½c.; larger than 6 in. on one or both legs, 1.96½c.; Beams, larger than 15 in., 1.96½c.; Zees, 3 in. and over, 1.86½c.; Tees, 3 in. and over, 1.91½c., in addition to the usual extras for cutting to extra lengths, punching, coping, bending and other shop work.

Plates.—All the Western manufacturers of Plates, with the exception of the Steel Corporation subsidiaries, are now quoting on the basis of 1.70c., Pittsburgh, while Eastern Pennsylvania mills are asking 1.80c., Pittsburgh, another advance of $2 a ton having been announced last week. Some sales have also been made by the Illinois Steel Company on the 1.70c. basis, but on extended deliveries 1.60c. can still be done. The trade having been previously warned of this contemplated action, heavy contracts were placed with the mills, one Eastern manufacturer having booked 8000 tons in this district. We quote: Tank Plates, ¼-in. and heavier, wider than 6¼ and up to 100 in. wide, inclusive, car lots, Chicago, 1.76½c. to 1.86½c.; 3-16 in., 1.86½c. to 1.96½c.; Nos. 7 and 8 gauge, 1.91½c. to 2.01½c.; No. 9, 2.01½c. to 2.11½c.; Flange quality, in widths up to 100 in., 1.86½c. to 1.96½c.; base, for ¼-in. and heavier, with the same advance for lighter weights; Sketch Plates, Tank quality, 1.86½c. to 1.96½c.; Flange quality, 1.96½c. Store prices on Plates are as follows: Tank Plate, ¼-in. and heavier, up to 72 in. wide, 2c. to 2.10c.; from 72 to 96 in. wide, 2.10c. to 2.20c.; 3-16 in., up to 60 in. wide, 2.10c. to 2.20c.; 72 in. wide, 2.35c. to 2.45c.; No. 8 up to 60 in. wide, 2.15c. to 2.25c.; Flange and Head quality, 0.25c. extra.

Bars.—The Illinois Central Railroad Company has made inquiry for 7000 tons of Iron Bars, but as yet the order remains unplaced. Despite the high prices prevailing in the East, makers competing in this territory are unable to secure more than 1.76½c., while the bulk of the tonnage is sold at a concession from this price of $1 a ton. New tonnage in Steel Bars is light, although heavy specifications tax mill capacities. We quote: Iron Bars, 1.71½c. to 1.76½c.; Steel Bars, 1.76½c., both half extras; Hoops, 2.16½c., extras as per Hoop card; Bands, 1.76½c., as per Bar card, half extras; Soft Steel Angles and Shapes, 1.66½c., half extras. Store prices are as follows: Bar Iron, 2.10c. to 2.25c.; Steel Bars, 2c. to 2.10c.; Steel Bands, 2c., as per Bar card, half extras; Soft Steel Hoops, 2.35c. to 2.45c., full extras.

Sheets.—Independent Sheet manufacturers as well as the American Sheet & Tin Plate Company have their output sold through March, and prompt shipments can only be secured from large distributers in this territory. Concessions can no longer be secured, owing to the high prices prevailing for Sheet Bars. Quotations are firmly maintained as follows: Blue Annealed, No. 10, 1.96½c.; No. 12, 2.01½c.; No. 14, 2.06½c.; No. 16, 2.16½c.; Box Annealed, Nos. 17 to 21, 2.51½c.; Nos. 22 to 24, 8.56½c.; Nos. 25 and 26, 2.61½c.; No. 27, 2.66½c.; No. 28, 2.76½c.; No. 29, 2.86½c.; No. 30, 2.96½c.; Galvanized Sheets, Nos. 10 to 14, 2.71½c.; Nos. 15 and 16, 2.91½c.; Nos. 17 to 21, 3.06½c.; Nos. 22 to 24, 3.21½c.; Nos. 25 to 26, 3.41½c.; No. 27, 3.61½c.; No. 28, 3.81½c.; No. 30, 4.31½c. Sheets from store, Blue Annealed, No. 12, 2.25c.; No. 14, 2.30c.; No. 16, 2.40c.; Box Annealed, Nos. 18 to 21, 2.70c.; Nos. 22 to 24, 2.75c.; No. 26, 2.80c.; No. 27, 2.85c.; No. 28, 2.95c.; No. 30, 3.35c.; Galvanized from store, Nos. 10 to 20, 3.20c. to 3.25c.; Nos. 22 to 24, 3.45c. to 3.50c.; No. 26, 3.55c. to 3.60c.; No. 27, 3.65c. to 3.85c.; No. 28, 4.00c.; No. 30, 4.55c. to 4.60c.

Merchant Pipe.—Building operations are being carried on without interruption owing to the open weather, and the demand for Pipe is as heavy as in the summer months. Discounts on car lots, Chicago, are firmly maintained as follows: Black Steel Pipe, 77.35, on the base sizes, ⅜ to 6 in., and Galvanized, 67.35. From store in small lots Chicago jobbers quote 74½ to 75 per cent. on Black Steel Pipe, ⅜ to 6 in. Iron Pipe is held at an advance of 4 to 5 points above these prices.

Boiler Tubes.—Specifications are reasonably heavy. Although consumers and distributers have been buying freely in anticipation of higher prices, it is doubtful if any action will be taken by the mills until after the first of the year. Mill quotations are as follows on base sizes, 2¾ to 5 in., in carload lots: Steel Tubes, 68.35; Iron, 55.35; Seamless, 50.35; 2½-in. and smaller and lengths over 18 ft., and 2½ in. and lengths over 22 ft., 10 per cent. extra. Store prices are unchanged, as follows:

	Steel.	Iron.	Seamless.
1 to 1½ in.	40	35	42½
1¾ to 2¼ in.	50	35	35
2½ in.	52½	35	30
2¾ to 5 in.	60	47½	42½
6 in. and larger	50	35	..

Merchant Steel.—Recent advances will effect only a small tonnage, inasmuch as consumers are covered to the middle of next year on contracts placed six months ago. Specifications show no decline in volume, and deliveries are deferred from 30 to 60 days. We quote: Planished or Smooth Finished Tire Steel, 1.96½c.; Iron Finish, up to

1½ x ½ in., 1.91½c.; Iron Finish, 1½ x ½ in. and larger, 1.76½c., base; Channels for solid rubber Tires, ¾ to 1 in., 2.26½c., and 1⅛-in. and larger, 2.16½c.; Smooth Finished Machinery Steel, 2.01½c.; Flat Sleigh Shoe, 1.71½c.; Concave and Convex Sleigh Shoe, 2.06½c.; Cutter Shoe, 2.35c.; Toe Calk Steel, 2.31½c.; Railway Spring, 1.96½c.; Crucible Tool Steel, 6½c. to 8c., and still higher prices are asked on special grades. Shafting, 50 per cent. off in car lots and 45 per cent. in less than car lots, in base territory.

Cast Iron Pipe.—Owing to the high prices prevailing for Pig Iron, Cast Iron Pipe manufacturers have been compelled to advance prices from $1 to $2 a ton. Many large consumers have recently withdrawn their inquiries, preferring to take chances on lower values in the next few months for their 1907 requirements. Quotations are revised as follows: Water Pipe, 4 in., $37 to $38; 6, 8, 10 and 12 in., $36 to $37; over 12 in., $35 to $36, with $1 extra for Gas Pipe.

Coke.—Only an occasional car lot of Connellsville Foundry Coke is offered in this market, and then at prices that are prohibitive. Shipments from the Virginia field are delayed on account of the car shortage, while local by-product operators are sold up practically through the first half of the year. We quote By-Product and Connellsville grades at $6.65 to $7, f.o.b. Chicago, and Virginia at $6.25 to $6.50.

Old Material.—Car Wheels have again advanced, sales having been made during the week at $24.50 to $25 per gross ton. Wheel makers, unable to secure adequate shipments of Pig Iron, are turning to the Old Wheel market for relief, and as the offerings are light each sale is at an advance over the previous transaction. The activity in Cast Scrap has subsided to a large extent and prices have remained stationary. We revise quotations on gross tons, car lots, f.o.b. Chicago, as follows:

Old Iron Rails	$28.00 to $29.00
Old Steel Rails, 4 ft. and over	21.50 to 22.00
Old Steel Rails, less than 4 ft	20.50 to 21.00
Heavy Relaying Rails, subject to inspection, 50 lb. and under	29.00 to 31.00
Old Car Wheels	24.50 to 25.00
Heavy Melting Steel Scrap	17.50 to 18.00
Frogs, Switches and Guards	18.00 to 18.50
Mixed Steel	15.00 to 15.50

The following quotations are per net ton:

Iron Fish Plates	$23.00 to $23.50
Iron Car Axles	27.50 to 28.00
Steel Car Axles	23.50 to 24.00
No. 1 Railroad Wrought	17.50 to 18.00
No. 2 Railroad Wrought	16.50 to 17.00
Railway Springs	16.00 to 16.50
Locomotive Tires, smooth	16.00 to 16.50
No. 1 Dealers' Forge	13.50 to 14.00
Mixed Busheling	12.50 to 13.50
Iron Axle Turnings	11.00 to 11.50
Soft Steel Axle Turnings	11.00 to 11.50
Machine Shop Turnings	11.00 to 11.50
Cast Borings	9.00 to 9.50
Mixed Borings, &c	9.00 to 9.50
No. 1 Mill	10.50 to 11.00
No. 2 Mill	9.50 to 10.00
No. 1 Boilers, cut to Sheets and Rings	12.50 to 13.00
No. 1 Cast Scrap	17.50 to 18.00
Stove Plate and Light Cast Scrap	14.00 to 14.50
Railroad Malleable	18.00 to 18.50
Agricultural Malleable	17.00 to 17.50

Pittsburgh.

PARK BUILDING, December 5, 1906.—(*By Telegraph.*)

Pig Iron.—There is some inquiry for Bessemer and Basic for third quarter and last half of next year delivery, but large consumers are opposed to paying the prices now ruling, while producers believe the market in the last half of next year will be practically as high as in the first half, with the result that so far very little has been sold for second half delivery. About the only large sale of the week was 4000 tons of Bessemer for first half at $22 and 6000 tons for third quarter at $21.50, both at furnace. Small lots of Bessemer for prompt delivery bring about $23 at furnace, but we continue to quote the actual market on Bessemer at $22.50. Basic for first half is offered at about $21.50, at furnace. The United States Cast Iron Pipe & Foundry Company has bought for its Scottdale, Pa., works 14,000 tons of Iron equal to No. 3 grade for second quarter delivery at $22.60, delivered at its works. Northern No. 2 Foundry for prompt delivery brings $23.50 to $24, at furnace. There is some inquiry for Forge Iron for first quarter delivery, and sellers are quoting on the basis of $22, at furnace, equal to $22.85, Pittsburgh.

Steel.—We continue to quote Bessemer Billets at $29.50 to $30, and Open Hearth, $32 to $32.50, Pittsburgh. A sale of 2000 tons of Open Hearth Billets is reported on the basis of $32.70, Pittsburgh, for first quarter delivery. We quote Sheet and Tin Bars, in random lengths, at $29.50 to $30, Pittsburgh.

Merchant Pipe.—Effective Wednesday morning, December 5, the National Tube Company advanced prices on Merchant Pipe one point, or $2 a ton. The extreme discount on ¾ to 6 in. is now 78 and 5 per cent. off to the large trade. No change was made in Boiler Tubes.

(*By Mail.*)

The situation as regards all kinds of Iron and Steel continues exceptionally strong, but prices are no higher with the exception of Angle Splice Bars, which have been advanced $3 a ton by the Carnegie Steel Company. Everything indicates that present conditions in the Iron trade will last through the first half of the year at least. There is some inquiry in the market for Bessemer and Basic Iron for second half of next year, but consumers are opposed to paying the high prices asked and so far practically nothing has been consummated. There are signs that the supply of Steel will be better after the first of the year, particularly in Sheet and Tin Bars, a local interest that is not usually a seller having been offering them for some time, and has taken considerable tonnage. There are no changes in prices of Finished Iron and Steel, but an advance in Pipe, and possibly in Boiler Tubes, may be made in the near future.

Ferromanganese.—There is a fair amount of inquiry, and prices are firm. We continue to quote 80 per cent. Ferro for prompt delivery at $85 to $87.50, and for forward delivery at $80 to $82.50, Pittsburgh.

Wire Rods.—As noted last week, Rods are exceedingly scarce and are hard to obtain at any price. We quote nominally $37 for Bessemer Rods, and $38 for Open Hearth, f.o.b. Pittsburgh. It is probable that Rods for prompt delivery would bring higher prices.

Muck Bar.—The available supply seems to be very limited. The demand is quite active, and prices are firm. We quote best grades, made from all Pig Iron, at about $37, and from part Scrap at about $34, Pittsburgh.

Skelp.—Mills rolling Skelp have their output sold for some months ahead and are much behind in deliveries. For this reason consumers find it difficult to place orders where reasonably prompt shipments are wanted. Prices are firm, and we quote: Grooved Steel Skelp, 1.65c. to 1.70c.; Sheared Steel Skelp, 1.70c. to 1.75c.; Grooved Iron Skelp, 1.75c. to 1.80c.; Sheared Iron Skelp, 1.85c. to 1.90c., Pittsburgh, these prices depending on widths and gauges.

Steel Rails.—In the past week the Carnegie Steel Company took orders for about 25,000 tons of Steam Rails, mostly for delivery on the Pacific Coast. The demand for Light Rails is fairly active, the Carnegie Company taking about 5000 tons since last report. This company has advanced prices on Angle Splice Bars $3 a ton, or from 1.50c. to 1.65c., Pittsburgh. We quote Light Rails as follows: 20 to 45 lb., $32; 16-lb., $33, and 12-lb., $34, at mill. Standard Sections remain at $28, at mill.

Structural Material.—A considerable tonnage of Steel remains to be placed for the new work to be erected by the Steel Corporation in the Pittsburgh District, and which will go to the American Bridge Company. No large contracts have recently been placed in this district, but some important work is under way, most of which, however, will go over into next year. All the Structural concerns are filled up for some time ahead, but specifications for medium sizes are lighter than in the summer and early fall. Prices are firm and we quote: Beams and Channels, up to 15-in., 1.70c.; over 15-in., 1.80c.; Angles, 3 x 2 x ¼ in. thick up to 6 x 6 in., 1.70c.; 8 x 8 and 7 x 3½ in., 1.80c.; Zees, 3-in. and larger, 1.70c.; Tees, 3-in. and larger, 1.75c. Under the Steel Bar card Angles, Channels and Tees under 3-in. are 1.60c., base, for Bessemer and Open Hearth, subject to half extras on the Standard Steel Bar card.

Plates.—Orders and specifications covering a heavy tonnage in both Universal and Sheared Plates continue to come into the mills, the requirements of Steel car interests and boat building concerns being much heavier than ever before in their history. On Universal Plates some mills are sold up for six months ahead, while on Sheared Plates none of the mills can make deliveries inside of 60 to 90 days. An enormous tonnage of Plates will be needed for contemplated gas and oil lines, part of which has been placed, while the rest is under negotiation. All the local mills are now quoting Plates on the basis of 1.70c., Pittsburgh. We quote: Tank Plates, ¼ in. thick, 6¼ in. up to 100 in. in width, 1.70c., base, at mills, Pittsburgh. Extras over this price are as follows:

	Extra per 100 lb.
Gauges lighter than ¼-in. to and including 3-16-in.	
Plates on thin edges	$0.10
Gauges Nos. 7 and 8	.15
Gauge No. 9	.25
Plates over 100 to 110 in.	.05
Plates over 110 to 115 in.	.10
Plates over 115 to 120 in.	.15
Plates over 120 to 125 in.	.25
Plates over 125 to 130 in.	.50
Plates over 130 in.	1.00
All sketches (excepting straight taper Plates varying not more than 4 in. in width at ends, narrowest end being not less than 30 in.)	.10
Complete Circles	.20
Boiler and Flange Steel Plates	.10
"A. B. M. A." and ordinary Firebox Steel Plates	.20
Still Bottom Steel	.30
Marine Steel	.40

Shell Grade of Steel is abandoned.

TERMS.—Net cash 30 days. For anticipated payments a maximum discount may be allowed at the rate of 6 per cent. per

annum and for a longer time than 30 days interest shall be charged at the same rate per annum. Invoices paid within 10 days from date thereof, discount of ½ of 1 per cent. is allowable. Pacific Coast base, 1.60c., f.o.b. Pittsburgh, with all rail tariff rate of freight to destination added, no reduction for rectangular shapes 14 in. wide down to 6 in. of Tank, Ship or Bridge quality.

Sheets.—The Sheet mills are not able to catch up on deliveries, new demand still being urgent, while contracts on the books of the mills represent a huge tonnage, and on which the mills are from four to six weeks or longer behind. Prices are firmly held, and we quote: Blue Annealed Sheets, No. 10 gauge and heavier, 1.80c.; Nos. 11 and 12, 1.85c.; Nos. 13 and 14, 1.90c.; Nos. 15 and 16, 2c.; Box Annealed, Nos. 17 to 21, 2.35c.; Nos. 22 to 24, 2.40c.; Nos. 25 and 26, 2.45c.; No. 27, 2.50c.; No. 28, 2.60c.; No. 29, 2.75c.; No. 30, 2.85c. We quote Galvanized Sheets as follows: Nos. 10 and 11, 2.55c.; Nos. 12 and 14, 2.65c.; Nos. 15 and 16, 2.75c.; Nos. 17 to 21, 2.90c.; Nos. 22 and 24, 3.05c.; Nos. 25 and 26, 3.25c.; No. 27, 3.45c.; No. 28, 3.65c.; No. 29, 3.90c., and No. 30, 4.15c. We quote No. 28 Gauge Painted Roofing Sheets at $1.85 per square, and Galvanized Roofing Sheets, No. 28 gauge, $3.15 per square for 2-in. corrugations. These prices are for carload lots, jobbers charging the usual advances for small lots from store.

Hoops and Bands.—Specifications on contracts are coming in freely, and a fair amount of new business is being placed. Prices are firm and we quote: Steel Hoops, 2c., and Bands for all purposes at 1.60c., base, half extras, as per Standard Steel card. These prices are for carload lots, f.o.b. Pittsburgh, plus full tariff rail rate to point of delivery, an advance of $2 a ton being charged for less than carloads.

Tin Plate.—New demand for Tin Plate is quiet, leading consumers having covered their requirements for some months ahead. Specifications on these contracts are coming in freely. Nothing official has been given out in regard to another advance in Tin Plate, but this may come at any time. The market is firm, prices being rigidly held. We quote $3.90 per base box, f.o.b. Pittsburgh, for 14 x 20 100-lb. Cokes, terms 30 days, less 2 per cent. off for cash in 10 days, on which price a rebate of 5c. a box is allowed for carload and larger lots.

Railroad Spikes.—A heavy tonnage in Railroad Spikes has been placed the past week or two by some of the leading railroads for delivery through the first half of next year. Spikes for prompt delivery are hard to obtain, and bring premiums. We continue to quote on contracts for indefinite delivery from $2.40 to $2.50 per 100 lb., while for specified delivery $2.75 and higher is being paid.

Iron and Steel Bars.—The mills do not seem to be catching up to any extent on back deliveries, specifications on contracts coming in freely, while the tonnage of new business is also quite heavy. Local makers of Iron Bars continue to quote at 1.80c. to 1.85c., Pittsburgh, but some of the Eastern mills are offering Iron Bars in this market at slightly less than these prices. We quote Steel Bars at 1.60c. to 1.65c., base, half extras, f.o.b. Pittsburgh, depending on deliveries. Iron Bars are 1.80c. to 1.85c., Pittsburgh.

Spelter.—The market has firmed up considerably again and prices are higher. We quote prime grades of Western Spelter at 6.30c., St. Louis, or 6.42½c., Pittsburgh.

Pipes and Tubes.—In addition to the contract for the Gulf Refining Pipe Line from the Indian Territory to Port Arthur, Texas, placed recently with the National Tube Company, it is said that no less than three other oil lines are to be built between the same points by other interests. One of these is the Guffey Petroleum Company, which is said to be figuring on the purchase of a line 496 miles long and to be of 6 and 8 in. Pipe. The Security Oil Company, it is claimed, will build a similar line and another interest will do likewise. Additional tonnage remains to be placed on the Western natural gas line referred to in this report last week. The general demand for Merchant Pipe continues heavy, and the mills have their output under contract for at least the first two or three months of next year. In view of the recent advance of $2 a ton in Plates and the general tendency toward higher prices on other materials, some in the trade believe that another advance in Pipe will be made in the near future. The extreme discount on Merchant sizes of Steel Pipe at the time of writing this is 79 and 5 per cent. off to the large trade. The official discounts, which are shaded one point or more to the large trade, are as follows:

Merchant Pipe.

	Jobbers, carloads.			
	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ in.	70	54	65.5	49.5
⅜ in.	72	58	65.5	57.5
½ in.	74	62	73.5	63.5
¾ to 6 in.	78	68	73.5	63.5
7 to 12 in.	73	58	69	54
Extra strong, plain ends:				
⅛ to ⅜ in.	63	51	58.5	46.5
½ to 4 in.	70	58	65.5	53.5
4½ to 8 in.	66	54	61.5	48.5
Double extra strong, plain ends:				
½ to 8 in.	50	48	53.5	42 5

Boiler Tubes.—There is a decided scarcity in the supply of Locomotive Tubes, the mills being covered with tonnage for the next two or three months. There is also a good demand for Merchant Tubes, and the market is very firm. Some in the trade believe that an advance in prices will be made in the near future. Official discounts are as follows:

Boiler Tubes.

	Iron.	Steel.
1 to 1½ in.	45	50
1¾ to 2¼ in.	45	62
2½ in.	50	64
2¾ to 5 in.	57	70
6 to 13 in.	45	62

Iron and Steel Scrap.—Conditions in the Scrap trade continue active, and prices are firm. A good deal of material is changing hands, but opinion is divided as to whether the market will go higher. Predictions are made that Heavy Steel Scrap will go to $22.50, while others believe the market is about as high as it will go. The consumption of Scrap for some time has been enormous, and promises to continue heavy for some months. Contracts for Bundled Sheet Scrap for first quarter and first half delivery have recently been made at much higher prices than on previous contracts. We quote Heavy Steel Melting Scrap at $20 for Pittsburgh or Sharon delivery; No. 1 Wrought Scrap, $21 to $21.50; No. 2 Wrought Scrap, $19 to $19.50; Old Steel Rails, short pieces, 6 ft. and under, for Open Hearth purposes, $20; Old Steel Rails, Rerollers, $22.50; Wrought Turnings, $15.50 to $15.75; Low Phosphorus Melting Stock, $25. Prices on Bundled Sheet Scrap seem to be slightly lower than last week, and we quote at $17.25 to $17.50; Cast Iron Borings are $13 to $13.25; Old Car Wheels, $25; Steel Axles, $24; No. 1 Cast Scrap, $20; Railroad Malleable, $19 to $19.50; Cast Iron Borings, $12.75 to $13; Iron Axles, $32 to $33; Stove Plate, $16 to $16.50, and Grate Bars, $15.50. All prices are per gross ton, f.o.b. Pittsburgh, unless otherwise specified. Through a typographical error in this report last week Wrought Turnings were quoted from $24 to $24.50, while the correct quotation should have been $15.50 to $15.75 per gross ton. We note sales of 12,000 to 15,000 tons of Heavy Steel Melting Scrap at $20, delivered, Sharon, Pa.; 2000 tons of No. 1 Railroad Wrought Scrap at $21.50, delivered, Youngstown, and 300 tons of Cast Scrap at $20.50, delivered, Pittsburgh.

Coke.—A number of new Coke ovens were started up in the Connellsville region last week, and the output was somewhat larger than for the previous week. The demand for both Furnace and Foundry Coke continues heavy, and it is scarce for prompt delivery. We quote Connellsville Furnace Coke for prompt shipment at $3.50 to $3.60 at oven, while for delivery for first half of next year it is held at $3.10 to $3.25 at oven. Best grades of 72-hour Foundry Coke are held at $4 to $4.50 a ton at oven on contracts. The Frick Coke Company will build four new plants in the Lower Connellsville region, to consist of 400 ovens near Smithfield, 400 ovens at Ronca, 400 ovens near Orient and 250 ovens on a branch of the Connellsville Central Railroad. The output of Coke last week in the Upper and Lower Connellsville regions was 401,909 tons, a slight increase over the previous week. The output of Coke in the Upper and Lower Connellsville regions for the first 43 weeks of this year is estimated at 11,869,915 tons, more than 1,000,000 tons in excess of the output for the same period last year and more than 4,000,000 tons over the same period in 1904. It is estimated that the total output of Coke in both Connellsville regions this year will be between 19,000,000 and 20,000,000 tons.

The Brown-Ketchum Iron Company works at Greensburg, Pa., and Indianapolis, Ind., has opened a branch office in room 918, Park Building, Pittsburgh, in charge of John R. Keers. The company manufactures Structural and Ornamental Iron and Steel.

The American Furnace & Machine Company, engineer and contractor, has moved its offices from the Publication Building to Room 1105, Fulton Building, Pittsburgh.

The general offices of the Allegheny Steel Company will be moved to Tarentum, Pa., about January 1. A three-story office building is nearly completed, and will be occupied by the office force of 100.

Cincinnati.

FIFTH AND MAIN STS., December 5, 1906.—(*By Telegraph.*)

Pig Iron.—The inquiry has quieted down somewhat both as regards prompt and forward deliveries. As a result of this the available tonnage of spot Iron shows a decided increase, and would be greatly augmented were it possible to secure cars enough to handle satisfactorily what is now on furnace yards awaiting shipment. Reports indicate that fully 80 per cent. of consumers are covered for the first half of next year, the urgency demands coming from those whose contracts are delayed by reason of car shortage. A week or two since the spot market occupied the attention of the trade, while to-day most of the business is being taken for future delivery. So far as prices are concerned, there is no

appreciable change, Southern No. 2 for prompt delivery being quotable from $22 to $23, Birmingham, with one large producer holding for $23.50; first quarter, $20 to $21; second quarter, $18 to $19, and last half, $17.50. We note one sale of 1200 tons at the latter figure, consumers showing more interest in the closing months of 1907 than a week since. There is an inquiry from a northern Indiana melter for 2000 tons of Northern Foundry, delivery running from April to September. Considerable Bessemer is said to be available from some furnaces on the basis of $23.50 to $24, Ohio furnaces, with Basic well cleaned up for the first four or five months of next year. High Silicon Irons are in less demand. Gray Forge is said to be plentiful, and to have been offered at $19 at furnace. One of the leading Pipe companies is said to have bought considerable tonnage during the week on the basis of $22. Freight rates from Hanging Rock District are $1.15 and from Birmingham $3. We quote, f.o.b. Cincinnati, as follows:

Southern Coke, No. 1	$26.00 to $27.00
Southern Coke, No. 2	25.00 to 26.00
Southern Coke, No. 3	24.00 to 25.00
Southern Coke, No. 4	23.00 to 24.00
Southern Coke, No. 1 Soft	26.00 to 27.00
Southern Coke, No. 2 Soft	25.00 to 26.00
Southern Coke, Gray Forge	22.00 to 23.00
Southern Coke, Mottled	21.00 to 22.00
Ohio Silvery, 8 per cent	29.15 to 29.65
Lake Superior Coke, No. 1	25.65 to 26.65
Lake Superior Coke, No. 2	25.15 to 26.15
Lake Superior Coke, No. 3	24.65 to 25.65
Car Wheel Irons.	
Standard Southern Car Wheel	$28.00 to $28.50
Lake Superior Car Wheel	27.00 to 27.50

Coke.—The market is strong and prices are firm. The business transacted recently has been principally transient trade, as most of the contracts covering first half have been made. We quote best brands of Connellsville and Virginia Foundry from $4.15 to $4.50, f.o.b. ovens.

Finished Iron and Steel.—Specifications are coming forward in large proportions and deliveries are well extended. Structural mills are now contracting for the last half of 1907, with some business developing. The market is firm, but prices are unchanged. We quote, f.o.b. Cincinnati, as follows: Iron Bars, in carload lots, 1.88c., with half extras; the same, in smaller lots, 2.10c., with full extras; Steel Bars, in carload lots, 1.73c., with half extras; the same, in smaller lots, 1.95c., with full extras; Base Angles, 1.83c., in carload lots; Beams and Channels, in carload lots, 1.83c.; Plates, ¼-in. and heavier, 1.83c., in carload lots; in smaller lots, 2c.; Sheets, 16 gauge, in carload lots, 2.15c.; in smaller lots, 2.70c.; 14 gauge, in carload lots, 2.05c.; in small lots, 2.60c.; Steel Tire, 1 x ¼ in. or heavier, 1.93c., in carload lots.

Old Material.—The demand is strong and prices are firm, with available tonnage finding a ready sale. We quote dealers' prices, f.o.b. Cincinnati, as follows:

No. 1 Railroad Wrought, net ton	$17.50 to $18.00
Cast Borings, net ton	9.25 to 9.50
Steel Turnings, net ton	11.50 to 12.50
No. 1 Cast Scrap, net ton	16.50 to 17.50
Old Iron Axles, net ton	26.50 to 27.50
Old Iron Rails, gross ton	26.75 to 27.25
Old Steel Rails, long, gross ton	19.00 to 20.00
Relaying Rails, 56 lb. and up, gross ton	28.50 to 29.50
Old Car Wheels, gross ton	22.50 to 23.00
Low Phosphorus Scrap, gross ton	21.00 to 21.50

The Rome Furnace Company, Rome, Ga., is now running on Coke Iron and selling it under the brand of Silver Creek. Hickman, Williams & Co. are exclusive agents for this furnace.

Birmingham.

BIRMINGHAM, ALA., December 2, 1906.

Pig Iron.—The market has latterly been exceedingly quiet. On account of the increased production some of the furnaces now have a limited amount of spot Iron to offer, which has relieved the situation materially. A number of sales this week went at $22 to $23. The only trading for next year was for second quarter delivery, the ruling price still being $19. The car situation remains unchanged, and stocks on furnace yards are daily growing larger. The car problem has been solved by a large Western concern in quite a novel manner. Shipments into this district are so billed that the cars when empty are delivered to certain furnace companies to be loaded with Pig Iron for that company. Inasmuch as it does an extensive business in this territory, it has suffered very little inconvenience on account of scarcity of cars. Production is going forward at a record breaking rate, and as some of the furnaces have only a limited storage room, what to do with this Iron will soon become a problem. The present accumulation is the largest for months, and if it continues to increase as for the past two months will probably have its effect on the market.

The Eagle Iron Company, Attalla, is making preparations to start its two stacks there on Charcoal Iron after a suspension of several months due to inability to secure charcoal. The two furnaces in this State now making this grade of Iron are unable to supply the demand, as a consequence of which prices are at high water mark, sales having been reported at $26 to $27 per ton.

Cast Iron Pipe.—The conditions from week to week are but little changed. Shortage of cars is having its effect, though very little stocks have as yet accumulated, as the labor situation is such that it is impossible to operate foundries to anything like capacities. Inquiries for next year's requirements are coming in more freely, and while there is yet a considerable difference of opinion as to prices which should prevail, buyers are beginning to realize that the sooner orders are placed the better, and are acting accordingly. Prices on Water Pipe are approximately as follows, f.o.b. cars here: 4 to 6 in., $33; 8 to 12 in., $32; over 12-in., $29, with $1 per ton extra for Gas Pipe.

Old Material.—There is no sign of a let-up in the demand for all grades of Scrap, and dealers are moving it as rapidly as it can be accumulated. Stocks in yards are depleted and all offerings are disposed of as soon as placed on the market. Prices are strong, and while the following are approximately correct, much higher prices are often paid for a grade which may be in urgent demand by a buyer. We quote as follows, per gross ton, f.o.b. cars dealers' yards here:

Old Iron Rails	$21.50 to $22.00
Old Iron Axles	19.00 to 19.50
Old Steel Axles	16.50 to 17.50
Old Car Wheels	18.50 to 19.50
No. 1 Railroad Wrought	19.00 to 19.50
No. 2 Railroad Wrought	15.50 to 16.00
No. 1 Country Wrought	15.50 to 16.00
No. 2 Country Wrought	12.50 to 13.00
Wrought Pipe and Flues	13.00 to 13.50
Railroad Malleable	13.00 to 13.50
No. 1 Steel	14.00 to 14.50
No. 1 Machinery Cast	15.00 to 15.50
Stove Plate and Light Cast	11.00 to 11.50
Cast Borings	8.00 to 8.50

The sales agents of the Tennessee Coal, Iron & Railroad Company and the Republic Iron & Steel Company will hold their monthly meeting in Birmingham this week. These meetings, which bring together one or more representatives from each agency, are usually held in Pittsburgh on account of accessibility, but as a number of the representatives have never visited the district it was deemed advisable to hold this meeting here that all might become more familiar with the properties. Several days will be spent in discussing market conditions and inspecting the various plants of the two companies.

BIRMINGHAM, ALA., December 4, 1906.—(*By Telegraph.*)—Official notice has just been given that effective February 1 the rate of freight on Pig Iron, Steel Billets, Rails and Cast Iron Pipe will be advanced 25c. per ton from Southern producing points to Ohio and Mississippi River crossings and points basing thereon; also to Eastern and Virginian cities. Relative advance will be made in rates on manufactured Iron to the same territory.

Philadelphia.

PHILADELPHIA, December 4, 1906.

Conditions in the Iron and Steel market are practically the same as last week. The scarcity of Pig Iron seems to become more pronounced day by day, and notwithstanding imports and a large home production there is a continual scramble to get Iron. The difficulty appears to be that consumers underestimated their requirements, so that month by month they find themselves short of Iron. Some consumers claim that they are not getting all they are entitled to, but it is beyond the power of any furnace to deliver more Iron than it can produce. As we said before, the current output of Pig Iron is probably the largest on record, but consumption has run ahead of it so that it is a continual scramble to get material to go on with. As regards large lots for forward delivery, everything seems to be taken up for the first half of the year, and it is almost an impossibility to get any one to quote on additional quantities. They say they have their capacity fully engaged, and to accept more business would only add to the embarrassment of both buyer and seller. This state of affairs is, of course, very annoying to both buyers and sellers, but there is no way out of it except to wait until there is a larger supply or a decrease in consumption. The latter, of course, no one desires, but it is one of those conditions that cannot well be avoided, unless, as we said before, production can be largely increased. Furnace owners are straining every nerve to meet the situation, and it is believed that they will be measurably successful, but up to this time things are no better than they were two or three months ago, if as good. In addition to imports of Pig Iron, considerable quantities of Foreign Ore have been brought in, so that the seaboard furnaces will probably be in better shape with their Ore supplies than was at one time anticipated. Coke is a very scarce commodity, however, and in fact, it is a fight from one end of the line to the other to get enough material to go on with. The car shortage is another embarrassment, so that on the whole prospects are not encouraging, although the difficulties of the entire situation may be defined as due to an excess of prosperity.

Pig Iron.—The scarcity of Iron is probably more pronounced to-day than it has been at any time during the year. It is almost impossible to purchase anything for December delivery, and even for the first quarter everything seems to be well sold up. Makers of Pig Iron are doing their utmost to meet the ends of their customers, but their best efforts fall short of meeting the case. Furnaces are doing pretty well, considering the difficulties they have to contend with, such as scarcity of labor and of transportation. Prices are probably a little higher than they were a week ago. In fact, they are decidedly so for spot lots, but it is felt that for long deliveries they are high enough. There has been but little done for forward delivery during the past few days, simply because there is practically no more Iron for sale, although there is some inclination to accept business for the last half, but nothing important has been done thus far. Sales therefore have been confined chiefly to carload lots, and from that up to 100 to 200 tons each, for deliveries during the remainder of this month or early in the new year. One 10,000-ton lot of Basic was taken for delivery during the summer months, prices said to have been about $22.50, delivered. Makers of this grade of Iron report themselves completely sold out, and it would be extremely difficult to get a quotation at any reasonable figure. One lot of something less than 1000 tons has been quoted at $23, furnace, delivery this month, but as yet it has not been taken. Low Phosphorus Iron is scarce and firm at about $27.50, delivered, or $26.75 alongside ship, Philadelphia or Baltimore. It is reported that one lot of two or three cars for spot delivery was sold at a considerably higher figure, but the case was probably somewhat exceptional. No. 2 X Foundry is quoted at about $24.50 to $24.75 for the second quarter, and about $25 for the first quarter, but it would not be safe to assume that any considerable tonnage could be had for either of these deliveries. Mill Irons are comparatively quiet, although they can be sold at last week's figures, but the demand is somewhat erratic, so that prices are liable to move up or down according to the character of the demand. In a general way quotations for deliveries during the first half of the year in eastern Pennsylvania or adjoining territory would be about as follows:

No. 1 X Foundry	$26.00 to $26.50
No. 2 X Foundry	24.50 to 25.00
No. 2 Plain	24.00 to 24.50
Standard Gray Forge	21.50 to 22.00
Ordinary Gray Forge	20.50 to 21.00
Basic	22.50 to 22.75
Low Phosphorus	27.25 to 27.75
Malleable	25.00 to 26.00
Middlesbrough No. 1, on dock	22.50 to 23.00
Middlesbrough No. 3, on dock	21.75 to 22.00
Scotch, on dock	24.00 to 24.25

Ferroalloys.—After last week's somewhat large transactions the market is rather quiet, the local demand having been fully satisfied. Prices are a little firmer, and would probably be about $73 to $73.50 for the first half, and about $80 to $82 for immediate delivery. Ferrosilicon is very scarce, and would command anywhere from $108 to $110, probably a little more than that for immediate delivery.

Steel.—Mills are so full that they are hardly in a position to quote for deliveries within the next 60 or 90 days, although they are making a good output. Prices are unchanged at $33 to $34 for Ordinary Rolling Billets, and $36 to $40 for Forging Billets.

Plates.—Following the advance announced last week the demand is comparatively light. Consumers have been anticipating higher prices, and therefore have bought heavily for forward delivery, some of the mills being sold close up for months to come. Nevertheless, whatever business is done is at the advanced prices, as manufacturers find it impossible to do any better with the present ratio of costs. Prices are as follows:

	Carload. Cents.	Part carload. Cents.
Tank, Bridge and Boat Steel	1.93½	1.98½
Flange or Boiler Steel	2.03½	2.08½
Marine	2.33½	2.38½
Locomotive Firebox Steel	2.43½	2.48½

The above are base prices for ¼-in. and heavier. The following extras apply:

	Extra per 100 lb.
3-16 in. thick	$0.10
Nos. 7 and 8, B. W. G.	.15
No. 9, B. W. G.	.25
Plates over 100 to 110 in	.05
Plates over 110 to 115 in	.10
Plates over 115 to 120 in	.15
Plates over 120 to 125 in	.25
Plates over 125 to 130 in	.50
Plates over 130 in	1.00

Structural Material.—Nothing has occurred beyond the usual routine business, which is very considerable, although not in excess of the capacity of the mills to supply. It is intimated in some quarters that advanced prices would probably be seen in the near future. Meanwhile we quote the same as last week: Beams, Channels and Angles, 1.83½c. to 2c., according to specifications.

Bars.—Prices are very strong, but it cannot be said that the demand is active. Most of the large buyers placed their orders two or three weeks ago, and are therefore not inclined to pay the advance which is now in force. About 1.83½c. is the usual quotation for Best Refined Iron but some ask a little more than that. Steel Bars are nominally 1.73½c. but at that figure deliveries are somewhat uncertain.

Sheets.—There is a very good demand, and prices have been advanced about one-tenth all round and are now quoted as follows, for carload lots, or a tenth additional for smaller quantities: Nos. 18 to 20, 2.70c.; Nos. 22 to 24, 2.80c.; Nos. 25 to 26, 2.90c.; No. 27, 3c., and No. 28, 3.10c.

Old Material.—The demand is unabated and very large sales have been made of Steel Scrap, probably 30,000 tons, during the week at $19.50 to a little better, holders now asking $20. In other descriptions there is some irregularity, according to where the Scrap is located. There is a tendency to ship to western and northern markets, which are relatively better than those in the East. The result is that the local buyers have less opportunity for selection, and prices are relatively dearer than they otherwise would be. The following are fair quotations, however, for bids and offers for lots delivered in buyers' yards:

Steel Crops	$20.00 to $20.50
No. 1 Steel Scrap	19.50 to 20.00
Low Phosphorus	24.00 to 24.50
Old Steel Axles	24.50 to 25.00
Old Iron Axles	32.00 to 32.50
Old Iron Rails	27.50 to 28.00
Old Car Wheels	23.00 to 23.50
Choice No. 1 R. R. Wrought	23.25 to 23.75
No. 1 Yard Scrap	21.00 to 21.50
Long and Short	19.50 to 20.00
Machinery Scrap	20.00 to 20.50
Wrought Iron Pipe	17.25 to 17.50
No. 1 Forge Fire	17.00 to 17.50
No. 2 Light	12.00 to 12.50
Wrought Turnings	15.50 to 16.25
Axle Turnings	17.00 to 17.50
Stove Plate	16.75 to 17.25
Cast Borings	13.00 to 13.50
Grate Bars	15.00 to 15.50

Cleveland.

CLEVELAND, OHIO, December 4, 1906.

Iron Ore.—The rush to buy Ore for 1907 delivery has subsided, and the market is now quiet. The large buying of both Bessemer and non-Bessemer for next year's delivery is now done, although there are some stragglers who have not yet bought. The Ores that have been sold have been largely the standard grades, the siliceous and low grade Ores not having sold so freely. The output of the standard mines, both Bessemer and non-Bessemer, and of the Mesaba and the old ranges, is about all sold for 1907. The market is strong, and there is a possibility that those who have Ore left will receive slight advances in price. They are now asking the advance, but as far as can be learned no sales have been made at an advanced price. Many furnacemen report that they have not bought their full supply of Ore for 1907, but it is believed that 75 per cent. of the requirements for the year has been purchased. One or two shippers are holding back on the sale of what they expect to produce next year. Some, however, have sold beyond what they may produce. Some anxiety is caused over the slump in the quantity of Ore that it was expected would be brought down from the Lake Superior ports during November and early in December. The unusually cold weather in the Lake Superior region in the latter part of November checked the movement of Ore, so that the total shipments for the year which were estimated at 38,000,000 tons are now placed at 37,000,000 tons. As a result some purchasers who expected to get Ore late this season are threatened with a shortage. The amount of Ore that will be brought down from now on will be very small. Most of the cargo insurance expired on boats that did not leave port by noon Wednesday. The preferred Steel boats have until December 12 to clear, and after that the only Ore to be carried will be on a few boats that carry no insurance. Shippers are holding back on charters for carrying Ore for 1907, but many charters are expected to be made before the end of the year. One of the leading shippers chartered vessel capacity for nearly 1,000,000 tons the past week. The vessels will get 75c. a ton from the head of Lake Superior, which is the same rate as the season contracts for 1906. Charters for 1907 will probably all be on the same basis as those of 1906, 75c. from the head of the lakes to Ohio ports, 70c. from Marquette and 60c. from Escanaba.

Pig Iron.—Furnaces are all behind with their orders, with no prospect of catching up. Some have stopped selling altogether, and are even refusing to sell now for the last half of next year. The market is very strong, especially for spot Iron, and there are many inquiries for immediate shipment. Northern No. 2 is selling at $25 and $26 for spot shipment, and some sales are reported at $27. In fact, producers say that they can get almost any price that is anyway reasonable for spot shipment. Some express a fear of a runaway market. At a few of the furnaces there is a very small amount of Iron that has not been contracted for. The quotations on Northern No. 2 for second quarter delivery are the same as on spot shipment. For second quarter delivery the price is $23, Valley furnace. Some producers, however, are asking from $23 to $25 for first half delivery. The output for the first half is about all

sold. For the last half of 1907 the price now quoted is $22 at furnace. In spite of the scarcity of Pig Iron at the Northern furnaces very little Southern Iron is being sold here, purchasers declaring that the present prices are almost prohibitive. Southern Iron now costs about the same as Northern foundry here, including freight, and even if buyers should want it at the present prices it would be almost impossible to have it shipped within a reasonable time because of the car shortage. The difficulty in getting shipments will become worse instead of better, now that winter is coming on. The price of Southern Iron is from $23 to $23.50 for No. 1, spot delivery, at Birmingham. No. 2 is quoted at from $22.50, spot at Birmingham. Prices for the first quarter delivery are the same. Second quarter Southern Iron is held at $19, with practically none offering.

Finished Iron and Steel.—According to reports of local dealers, the market was never better in all departments. It is not a question of sales now but of deliveries. Some producers are 60 days behind in Structural Material, 30 days behind in Plates and three or four months behind in Bars. Bar Iron is still selling here on the basis of 1.80c., Pittsburgh, but some of the local dealers are asking 2 cents out of stock. There has been heavy selling of Plates and Structural Material the past week. Large orders have also come in for Bridge Material. Steel Bars are sold on the basis of 1.60c., Pittsburgh, but some dealers are asking 1.95c. out of stock. Forging Billets are selling at $35 to $36, and some sales have been reported at higher than $36. They are very scarce and hard to get. No prices are given for future delivery. Sheets are still being sold out of stock, the mills being far behind with their orders. The prices out of stock are 2.25c. for No. 10 Blue Annealed; 2.90c. for One Pass Cold Rolled, and 3.90c. for No. 28 Galvanized Many contracts have been given out the past week fot Structural Material, Plates and Bars for first half delivery in 1907.

Coke.—The Coke market is strong and the demand is brisk. Connellsville Coke is selling at $4.25 at oven for spot shipment and for the first half of 1907 delivery. Furnace Coke is selling on the basis of $3.35 to $3.50 at oven, both for spot shipment and on contracts for first half delivery.

Old Material.—The market has been quiet the past week, and it is believed that prices have reached their limit. While inquiries are not numerous, because consumers have loaded up pretty well till the end of the year, yet Scrap continues scarce and ordinary Cast is selling for $18, Cleveland. The following are the dealers' prices to the trade, f.o.b. Cleveland, per gross ton:

Old Steel Rails	$19.00 to $20.00
Old Iron Rails	27.00 to 27.50
Iron Car Axles	27.50
Old Car Wheels	22.00 to 23.00
Heavy Melting Steel	18.00 to 19.00
Cast Borings	10.00 to 10.50
No. 1 Busheling	17.75 to 18.00
No. 1 Railroad Wrought	20.00 to 20.50
No. 1 Cast	21.00 to 22.00
Iron and Steel Turnings and Drillings	13.50 to 14.00

New York.

NEW YORK, December 5, 1906.

Pig Iron.—Foreign Foundry Iron is selling right along and threatens to go higher since prices have been sharply advancing in the primary markets. Domestic producers are so well sold up that they find it difficult to quote, and prices named therefore vary within a wide range. We quote Scotch, good makers' brands, $24 to $24.50, ex-ship, duty paid, for No. 1, Middlesbrough No. 1 $23 to $23.50 and No. 2 $22 to $22.50. We quote for Northern Irons for delivery during the first half $26 to $27 for No. 1 Foundry, $24.50 to $25 for No. 2 Foundry and $24 to $24.50 for No. 2 Plain.

Steel Rails.—The large business for 1907 has been quite generally placed, and deliveries before the fall of that year would be difficult to secure. The Shasta Southern has placed a contract for 12,500 tons; the Buffalo, Rochester & Pittsburgh for 3500 tons; the Northern Electric for 2000 tons, and the Oregon Electric for 2500 tons. There is still a considerable volume of business for next year to come out from Southwestern, Southern and Eastern lines, and additional orders are expected from roads that have already placed contracts corresponding to their original estimates for 1907.

Structural Material.—A fair amount of business has been taken in the past week by bridge and other construction companies, and the new tonnage entered by the mills keeps up well considering that the season of inactivity has set in, according to the calendar. Outdoor operations have been much helped, however, as was the case last year, by the delay of severe weather. The inquiry of the Brooklyn Heights elevated line for Steel for the elevated work on the Brighton extension is one of the largest now up, amounting to several thousand tons. The Philadelphia Rapid Transit Company placed a contract for 5000 tons for elevated work with the American Bridge Company, bringing the November bookings of that company up to 50,000 tons. The New York Central Railroad is in the market for a portion of the Steel required for its new work between Forty-fifth and Fiftieth streets. The entire contract, amounting to 40,000 tons, was let three years ago, but the work was delayed and the contract canceled. This business is now coming out piecemeal and may be prolonged over the next few years. Among the contracts placed in the past week are 600 tons for the Pennsylvania Railroad, 700 tons for the Virginia & Southwestern, 850 tons for the West Side Belt Railroad at Pittsburgh, 400 tons for the New Haven road, 800 tons for the New York Central, and several hundred tons for the New York, Ontario & Western and the Central of New Jersey. We quote on tidewater deliveries, mill shipments, as follows: Beams, Channels, Angles and Zees, 1.84½c.; Tees, 1.89½c.; Bulb Angles and Deck Beams, 1.99½c. On Beams 18 to 24 in. and Angles over 6 in. the extra is 0.10c. Sales out of stock of material cut to length continue to be made at 2¼c. to 2½c.

Bars.—The situation is unchanged. Bar Iron manufacturers quoting 1.84½c. to 1.89½c., tidewater, with by far the larger number quoting the higher rate. The demand is good, with some disposition shown to make contracts for future delivery. Steel Bars are quoted at 1.74½c. to 1.84½c., tidewater, according to time of delivery, but the mills quoting the lower rate are usually not in a position to promise early shipments.

Plates.—The situation appears to be growing still stronger. Some of the large Eastern manufacturers have again advanced prices $2 per ton, or to the basis of 1.80c., Pittsburgh, and are taking considerable business at the new price. Other companies are quoting 1.70c., Pittsburgh, but are discriminating in taking orders, and for early delivery or for specifications not particularly desirable would ask an advance on this price. Quotations are as follows at tidewater for carload lots: Sheared Tank Plates, 1.84½c. to 1.94½c.; Flange Plates, 1.94½c. to 2.04½c.; Marine Plates, 2.24½c. to 2.34½c.; Firebox Plates, 2.34½c. to 2.70c., according to specifications.

Cast Iron Pipe.—No indication yet appears of any diminution in the demand for Pipe for next year's delivery. A continual stream of small and medium sized orders is pouring into the foundry offices. Some very important business is coming up in the near future. The city of New Orleans will open proposals January 23, 1907, for six lots of 4 to 42 in. Cast Iron Pipe and special castings, aggregating approximately 38,000 tons of Pipe and 1100 tons of special castings. Manufacturers are steadily becoming sold up further into the future, and prices are exceedingly firm at a minimum of $34.50 per net ton at tidewater for 6-in. for delivery late next spring, and from that to $36 or more for earlier delivery.

Old Material.—The feature of the week has been the entrance into the market of three of the large Steel manufacturers of eastern Pennsylvania. It is estimated that some 30,000 tons of heavy Melting Steel Scrap have been purchased for deliveries, running through the next 60 to 90 days at $19 to $19.50, delivered at works The transactions in Steel Scrap are by far much larger than for many weeks. The rest of the market on Old Material is in exceedingly good condition. As has been the case for some considerable time, Heavy Cast Scrap and Stove Plate are particularly active. Borings and Turnings are also moving freely, and a considerable tonnage has been disposed of during the week. In every class of material the demand appears to be increasing, while stocks are running low. Approximate prices for New York and vicinity per gross ton are as follows:

Old Iron Rails	$24.50 to $25.00
Relaying Rails	28.00 to 29.00
Old Steel Rails, rerolling lengths	18.50 to 19.00
Old Steel Rails, short pieces	16.25 to 16.75
Heavy Melting Steel Scrap	16.25 to 16.75
Standard Hammered Iron Car Axles	29.00 to 30.00
Old Steel Car Axles	21.50 to 22.50
No. 1 Railroad Wrought	21.00 to 21.50
Iron Track Scrap	18.00 to 18.50
No. 1 Yard Wrought, long	18.50 to 19.00
No. 1 Yard Wrought, short	18.00 to 18.50
Wrought Pipe	14.50 to 15.00
Light Iron	10.00 to 11.00
Cast Borings	10.00 to 11.00
Wrought Turnings	13.00 to 14.00
Old Car Wheels	21.00 to 22.00
No. 1 Machinery Cast	18.00 to 19.00
Stove Plate	14.50 to 15.00
Grate Bars	13.50 to 14.00
Malleable Cast	18.00 to 19.00

A New Tennessee-Republic Ore Company.—The Potter Ore Company was recently incorporated in connection with the acquisition of the Potter iron ore properties in Red Mountain, Alabama, by the Tennessee and Republic companies. The ore company has issued $700,000 in 25-year 5 per cent. bonds, which, with $100,000 cash, were the consideration in the purchase. These bonds are guaranteed by the Tennessee Coal, Iron & Railroad Company and the Republic Iron & Steel Company. Frank H. Crockard, vice-president and general manager of the Tennessee Company is president of the Potter Ore Company.

Metal Market.

NEW YORK, December 5, 1906.

Pig Tin.—The statistics as compiled by C. Mayer, secretary of the Metal Exchange, were not favorable to holders of Pig Tin, and on the following day the market declined. The visible supply on November 30 was figured as 12,395 tons, as compared with 13,173 tons the same date a year ago, and 11,162 tons a month ago. The stocks in the United States were 175 tons greater than at the end of October, or 1210 tons. Deliveries into consumption in the United States were small, amounting to but 3150 tons. Those well informed on the situation think that the decrease of approximately 800 tons during the past year has been more than discounted by an advance in price of over 8c. per pound, and they say without reservation that were it not for an unparalleled prosperity in the Iron and Metal trades not only in this country but in foreign countries such a price could not be held. It is prophesied that at the end of December the visible supply will compare even more favorably with that of the preceding year. Support is given to this theory, too, by the fact that the visible supply has been increasing for the past three months as against the corresponding time of the previous year; at the end of September the visible supply was 2300 tons below that of the previous year, and at the end of October was 1600 tons below. Although shipments from the Straits during the first 11 months of this year show a decrease of 111 tons, as compared with the same period last year, those from Australia show an increase of 879 tons during the same period. Shipments from Bolivia and China also show increases. Prices during the week show a steady decline, the highest price having been reached Friday when sales were made at 43.17½. To-day's price is lower at 42.45c., following the sharp break in the London market. Prices in London closed to-day at £194 for spot and £194 10s. for futures. There is no longer any fear regarding a shortage of metal this month, as 680 tons have already arrived, and there are afloat 3385 tons, nearly 2000 tons of which will reach here before December 20.

Copper.—Prices are higher, both for future and nearby deliveries. Sales have been made during the week on a basis of 22.75c. for December Electrolytic, and January has been taken at nearly the same price. Choice brands of Lake for nearby delivery, such as Calumet & Hecla and Quincy, are held at 23c., and forward shipments at 22.75c. The United Metals Selling Company continues to hold the April Copper it has for shipment at 22.25c. Exports of Copper from north Atlantic ports during November aggregated 17,451 tons, making the total exports since the first of the year 189,605 tons, which is practically 32,000 tons under the exports during the same period last year, as they amounted to 221,705 tons. During the same time the imports have increased approximately 10,000 tons, so there has been practically 42,000 tons more Copper available for domestic consumption this year than last, not taking into consideration any increase in production. On the whole figures indicate that there has been available for domestic consumption an increase of about 30 per cent. over that of last year. This is remarkable considering the fact that the increase in Pig Iron consumption will probably be only a little more than 10 per cent. There is little doubt that the smaller exporters of Copper in this country are being discriminated against in the matter of price, and frequently have to shop around considerably before they can obtain any metal for export. The large producers wish to control the selling of Copper through their own European agencies. Sales of cask lots of Lake are made with considerable freedom at 23.25c., and Electrolytic at 23c. Large lots can be had at concessions from these figures, although a bid of 22.75c. for December Lake was turned down early in the week. The London market is easier to-day and closes at £102 15s. for spot and £103 15s. for futures. The exports so far this month amount to but 1279 tons.

Pig Lead.—Carloads of spot Lead are scarcely to be had and December shipments are held at 6.05c. The price in St. Louis is unchanged at 5.87½c., and the attitude of the American Smelting & Refining Company is as unchanged as its prices. The scarcity of Lead is well illustrated by the statement that one large consumer has but 30 tons on hand, when it usually has 500 tons and over.

Spelter.—A much firmer tone prevails and prices are stronger, sales having been made on a basis of 6.50c. to 6.55c., New York, and 6.35c., St. Louis. The demand from both Brass mills and Steel manufacturers is very heavy.

Antimony.—There is considerable manipulation in this market, and high prices are being quoted. As practically all sellers of Antimony have large stocks it can be readily seen why there is an attempt to bull the market. We learn of Hallett's Antimony being offered for shipment from Europe during February equivalent to 24.25c., with no takers. The market has been quoted at 25.50c. for Cookson's, 25c. for Hallett's and 24.50c. to 25c. for outside brands, but on favorable orders these prices would probably be shaded.

Ferroalloys.—While the demand is good, it is not so urgent as a month ago, and consumers are more disposed to shop round and try to secure lower prices. In many cases they are successful, and we learn of a sale of Ferrosilicon at under $104, although the generally quoted price is $104 to $106. In Ferromanganese there have also been vain attempts to advance prices, but it can still be had at $78, f.o.b. cars.

Tin Plate.—Shipments are very much belated and this is causing no little inconvenience to consumers, who would willingly buy in Europe if they could gain anything by it; but the Tin Plate mills in Wales are congested with orders. Foreign Plates are slightly easier at 15s. In New York 100-lb. Coke Plates are unchanged at $4.09. In Pittsburgh the old price of $3.90 continues.

Old Metals.—There is an excellent demand, and for choice lots dealers might ask advances over the following selling prices:

	Cents.
Copper, Heavy Cut and Crucible	21.00 to 21.50
Copper, Heavy and Wire	20.50 to 21.00
Copper, Light and Bottoms	18.75 to 19.00
Brass, Heavy	15.00 to 15.50
Brass, Light	12.00 to 12.50
Heavy Machine Composition	19.00 to 19.50
Clean Brass Turnings	13.75 to 14.25
Composition Turnings	16.75 to 17.25
Lead, Heavy	5.75
Tea Lead	5.50
Zinc Scrap	4.90

Iron and Industrial Stocks.

NEW YORK, December 5, 1906.

One of the most interesting episodes of the past week has been the continued advance in Virginia Iron, Coal & Coke stock, which reached 92 on Tuesday. Railway Spring Steel also advanced sharply, selling up to 58¾ on Monday, as against 53 on the previous Friday. Another stock to show conspicuous strength was Steel Foundries preferred, which touched 48⅜ on Tuesday, against 44⅛ on Friday of last week. The general market has been strong, notwithstanding the scarcity of money and the high rates asked on call loans, which on one day reached over 25 per cent. Considerable interest is being taken in the meeting on Thursday of the directors of the American Car & Foundry Company, as it is expected that at that time a resumption of dividends on common stock may be decided upon. This company is stated to have booked the past three months a larger volume of business than ever before in its history, and at very satisfactory profit. The range of prices on active stocks during the week ending Tuesday night was as follows: United States Steel common 47⅛ to 48⅝, preferred 104¾ to 105⅛; Car & Foundry common 44⅛ to 46⅛; Locomotive common 75 to 76½; Colorado Fuel 54½ to 56½; Pressed Steel common 54 to 55⅞; Republic common 38 to 38¾, preferred 101 to 101⅝; Sloss-Sheffield 75 to 77½; Tennessee Coal 162 to 166; Cast Iron Pipe common 46 to 47⅜, preferred 86¼ to 87¾. Last transactions up to 1.30 p.m. to-day are reported at the following prices: Car & Foundry common 45⅝, preferred 102; Locomotive common 75¼, preferred 111; Steel Foundries common 11, preferred 47½; Colorado Fuel 56½; Pressed Steel common 55, preferred 99½; Railway Spring common 56½; Republic common 38, preferred 101; Sloss-Sheffield common 75; Tennessee Coal 164; United States Cast Iron Pipe common 45⅝; United States Steel common 48⅛, preferred 104⅞; Can common 6¼, preferred 55¾. Rights on subscriptions to Tennessee Coal & Iron stock have sold on the Exchange during the past week at 7½ to 8.

Dividends.—The Boston Belting Company has declared a quarterly dividend of $2 and an extra dividend of $2, both payable January 1.

The American Can Company has declared the regular quarterly dividend of 1¼ per cent. on the preferred stock, payable January 2.

The International Silver Company has declared the regular quarterly dividend of 1 per cent. on the preferred stock, payable January 1.

The Executive Committee of the Sloss-Sheffield Steel & Iron Company has recommended to the Board of Directors the payment of an annual dividend of 7 per cent. on the preferred stock for 1907. The dividend is to be paid in quarterly installments on January 2, April 1, July 1 and October 1. This is the same rate as is now being paid.

The Ashland Coal & Iron Mining Company, Ashland, Ky., has declared a quarterly dividend of 1 per cent. on the common stock, payable December 20.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has declared a quarterly dividend of 1½ per cent. This company contemplates some large additions to its plant, definite plans for which are now under way.

Steam Turbine Troubles.—The most serious trouble experienced with the Parsons turbine has been the tearing out of blading when the rotor and stator have come into accidental contact. There being no supports at the

outer ends of these blades a very slight contact is likely to cause trouble. The main cause of such trouble has been the distortion of the casing of the turbine, due usually to unequal expansion, either in the casing itself or in the piping leading to and from the turbine. Still another cause for this distortion is the pressure upon the casing, due to the vacuum in the condenser. This amounts to some 13 or 14 lb. per square inch, and when applied to the large area of the opening leading to the condenser produces a heavy stress within the casing. An ingenious plan for overcoming this has been adopted both in Europe and in the United States. It consists in placing the condenser under the turbine and suspending it from the latter by bolting it solidly to the casing, while the turbine itself is supported on an independent foundation. The weight of the condenser is then taken by a flexible foundation, consisting of some type of springs. This not only relieves the turbine of any stress due to the weight of the condenser, but prevents any possible distortion due to the "pull" of the vacuum.

An Improved Form of Superheater.—Acting upon the conviction that the efficiency of superheating depends not so much upon mere area of superheating surface as on the form and section of that surface, a Russian engineer has devised an improved form of superheater, which is intended to effect more efficient distribution of the heat to the saturated steam. He has used an internally ribbed tube, with an arrangement of superheater connections and construction by means of which the furnace gases are passed around the outside and the saturated steam passed through the ribbed sections. Owing to the requirements of locomotive operation the apparatus is arranged to be by-passed when steam is not being used. It is found that each area unit of superheating surface in the ribbed section is equivalent to a surface 50 per cent. greater in a similar round section, so far as efficiency of superheating is concerned. Apparatus of the new type, occupying the same space as the present form of locomotive superheaters now very generally in use on the German railroads, has been found, as a result of tests, to be 103 per cent. more efficient.

An Interesting Scotch Crane.—A new electrically operated crane at the yard of the Scott Shipbuilding & Engineering Company, Greenock, Scotland, having a radius of action of 70 ft. and placed 7 ft. from the edge of the quay, can deposit its maximum load of 100 tons at a distance of 63 ft. from the quay wall. The crane is mounted upon three pedestals, giving clearance for the sides of the vessel and for the tracks along the quay. The maximum load may be raised at 5 ft. per min.; loads under 50 tons at 10 ft. per min.; under 10 tons, at 40 ft. per min. The speed of slewing with full load is 100 ft. per min. The crane is operated by four motors; one of 50 hp. at 290 rev. per min. is used for derricking the jib; one of 50 hp. for the main purchase hoist; one of 35 hp. for light hoisting; one of 35 hp. for slewing. All are operated independently and are fitted with both automatic and hand brakes. At radii beyond that for maximum load the crane can handle 90 tons at 75 ft.; 80 tons at 80 ft.; and 60 tons at 90 ft. An independent light gearing lifts ten tons or less at a radius up to 100 ft.

Southern Blast Furnace Conditions.—The Tennessee Coal, Iron & Railroad Company made new records in November in production at its coke ovens, iron and coal mines and limestone and dolomite quarries. In pig iron the November production, 63,398 tons, was the largest yet made from the furnaces now being operated, and compares with 69,350 tons produced in one month, when the two Sheffield, Ala., and two South Pittsburg, Tenn., furnaces were operated by the Tennessee Company. Two furnaces at Ensley are now banked, while raw materials are being accumulated to carry the Ensley group through the holidays. Meantime pig iron accumulated on account of car shortage will be shipped. All Southern furnaces are now accumulating raw materials against the holiday idleness of their workmen, and some of them are running their engines slower meantime to keep all furnaces in, though with decreased outputs.

New Publication.

Poor's Manual of Railroads. Published by Poor's Railroad Manual Company, 68 William street, New York. Cloth, 1800 pages. Price, $10.

The thirty-ninth annual number of this well-known manual of railroads, which stands in the front rank of works of reference, has been made more complete than any previous volume. Incorporated in this edition are the following important features heretofore published separately in the *Railroad Manual Appendix*: 1, All data embraced in Poor's Ready Reference Bond List; 2, Table of annual meetings, transfer agencies, &c.; 3, Table of dividends paid for eight years. By the insertion of these details and the natural expansion of the regular departments of the book, the work this year has increased in text 192 pages. In addition to very comprehensive information relative to the railroads of the United States, statements for over 600 industrial corporations are given, statements for no less than 120 new industrial corporations having been procured and incorporated in this issue. It further includes the railroad companies operating in Canada and the leading railroads in Mexico. It contains 24 colored plates, State and group maps, and 59 maps of leading railroads. The department of electric railroad systems contains statements of these enterprises in as complete and comprehensive a form as those of the steam lines upon which the reputation of the manual has been built.

Incandescent Filaments and Fire Damp.—Experiments on the action of incandescent wires or filaments upon fire damp give some interesting results. The conductor alone has no effect in bringing about an explosion unless it becomes broken and an arc is formed. This feature seems to be independent of the character of the metal used for the filaments. A lamp bulb filled with fire damp did not explode, even at a very high voltage, but did so at once upon the breaking of the filament. This difference between fire damp and illuminating gas is thought to be due to the different ionizing properties of the two gases. It is not necessary that the wire should be incandescent at the time of breaking in order to cause an explosion, as was determined by trials with lead and other metals. An explosion can be avoided by using a shunt circuit around the break point, but in this case, for best results, the resistance of the shunt should not be too high. Self induction in the shunt circuit is likely to cut down the chance of an explosion.

Endurance of Modern Artillery.—Two vulcanite casts recently received at the United States War Department offer a valuable illustration of the superior endurance of modern artillery using smokeless powder, as compared with the guns which burned the old black powder. The casts show the interiors of two 12-in. guns. The first is that of a piece which had been fired 250 times with black powder and then relined. The bore of the gun was so deeply pitted that the cast resembles the bark of the roughest of old oak trees. The cavities are deep enough to contain walnuts, and the rifling has completely disappeared. The second cast was made from a gun which had been fired 300 times with smokeless powder. There was some erosion, but not enough to destroy the lands of the rifling, and the interior was fairly smooth.

In 1904 there were carried on the average of each of the 212,000 miles of railroad in the United States no less than 104,000 passengers. Great as this total is, it is much less than similar figures for other countries. In Germany in 1898 the density of traffic was represented by 342,000 passengers per mile of track; in France, in 1897, it was 283,000; in Austria, 214,000, and in India, 289,000.

The Machinery Trade.

NEW YORK, December 5, 1906.

While there was no apparent falling off in business during the week the great activity that has prevailed for the past few months has quieted down to some extent, especially among the new propositions of large magnitude. Several of these which were expected to come to a head weeks ago have been held back until after the first of the year. The inquiries being sent out are mostly for small lots, and both these and the orders are generally for completing equipments, the purchases of which were started some time ago. The railroads have been buying individual tools daily, the aggregate being very large, but they have not come into the market with lists of any size. It is thought that the railroads will not promulgate new specifications until early in the new year, at which time the programmes for the next year will be made up. Revised price-lists have lately been received by dealers from some of the Western builders, but they are understood to only cover the advance in prices made some time ago. A prominent machine tool builder thinks that another general advance in prices at present is unlikely, as tools now being sold will, in many instances, not be delivered until the latter part of 1907, and it is a little too early to make quotations for 1908.

Sales for November were exceptionally heavy, new records having been made by several of the important houses in this territory, who state that it was the best month in their history. The business transacted was especially gratifying, in that it was made up mostly of small and medium sized orders taken at advanced prices.

One of the largest orders for machine tools placed for a long time has been received by the Niles-Bement-Pond Company, New York. The order was placed by the Indiana Steel Company for machinery for its new plant at Gary, Ind., and covered tools aggregating in value $145,000. The Indiana Steel Company has been buying large quantities of equipment for the past few months, and it is probable that it will continue to make purchases for some time to come. The company is only erecting and equipping a part of the plant which it has planned, and as it intends to build a part each year until completed the machinery trade can look for further large orders from that source.

The Mergenthaler Linotype Company is buying machinery to equip a building recently acquired by the company adjacent to its present plant at 24 Ryerson street, Brooklyn, N. Y. The company some time ago purchased a piece of property on Park avenue, between Hall and Ryerson streets. The tract is about 75 x 100 ft. and it includes, in addition to some houses on Ryerson street, a factory building three stories in hight formerly occupied by the Jennings Lace Works. This building is to be equipped with machine tools in order to increase the company's manufacturing facilities, and some time ago a large order was placed with the Niles-Bement-Pond Company for a considerable number of milling machines. Within the last week or so the same company has been given an order for 15 bar drill presses, and an order has been placed with Manning, Maxwell & Moore for a 3½-in. and 2½-in. turret lathe. It is not thought that this complement of tools will by any means equip the newly acquired property, and it is expected that there will be more orders placed shortly. The company will in all probability build up the remainder of the property, as it is known that the demand for its machines far exceeds its present facilities for production. For some time past the officers of the company have been looking into several propositions for factory sites, and it is probable that before long the trade will hear of further extensions. The company can hardly expand its Brooklyn works any further than to the limits of its recently acquired property, and present indications are that in addition to its Brooklyn works other manufacturing facilities will be needed. Most of the sites looked up by the company's officials are in the vicinity of New York, and if a new plant is built in all probability it will be erected near this city.

The Erie Railroad has about completed purchases of tools in its large list issued a short time ago. The orders were pretty well scattered. This machinery is required for equipping its shops at Susquehanna, Pa., and as these shops are only a part of the large improvements contemplated for that point, it is thought that the company will make further extensive purchases of equipment during the next year.

The plant which is to be built at Minneapolis, Minn., by the Spencer Kellogg Company, Buffalo, N. Y., will consist of 48 20-plate Buckeye hydraulic presses with the usual equipment of pumps, accumulators, formers, heaters, trimmers, &c. An especial oil refinery will be built in conjunction with the plant and large oil and seed storage tanks will be put in. The buildings will be fireproof and the machines will be operated by motors, power for which will be supplied either by gas engine generator units fed by gas producers or by electricity taken from the power lines of the companies now in Minneapolis. The mill will be arranged so that 48 additional presses can be put in later, making a total of 96 at that point. Work on the mill will probably be started early in the spring.

Arrangements are being made by Haebler & Co., 79 Wall street, New York, for the erection of a cement plant somewhere in Kansas or Indian Territory. As yet the company has not selected a site, nor have plans been drawn for the proposed plant. The company, it is said, will shortly select an engineer who will arrange the details, and the machinery will very probably be bought from the New York office.

The Cook Spring Company, 247 Centre street, New York, which arranged some time ago to erect a two-story factory building on Division street, Jersey City, has decided not to build there, but has acquired an existing plant in the vicinity of New York, and will shortly add to its manufacturing facilities. It is understood that the company has not as yet purchased all of its machinery, and it is very probable that before long the trade will hear of some requirements from that source.

The Western Iron Works, Winnipeg, Man., will probably purchase considerable machinery for its new plant, the plans for which are now being prepared. The total cost of the buildings and equipment will be $65,000, and the plant will consist of a machine shop, foundry, structural shop and ornamental iron department. The company would be pleased to hear from houses desiring a Western representative for mill and transmission machinery.

The Marine Metal & Supply Company, 167 South street, New York, has had some inquiries in the market for equipment for a warehouse and machine shop the company is erecting in Jersey City. It is understood that some machinery equipment has been purchased, but the buying has not been completed as yet.

The Conemaugh Valley Railroad Company is arranging to build an electric line from Johnstown to Ebensburg, Pa., with a branch from Mineral Point to Southfork and Summerhill. The road will be about 19 miles in length, and the system will serve an area which has a population of about 85,000. Work will be begun on the line as soon as possible, and we are informed that contracts for the equipment, including the power machinery and steel rails, will be awarded before long. W. Milt Brown of Johnstown, Pa., has been retained as electrical engineer and William Butler of Palmyra, N. J., is in charge of the civil engineering and construction department. He is now located in Johnstown and is making arrangements for the construction work.

Walter Kidde, 85 Liberty street, New York, has been getting figures on 3000 kw. of steam turbines for a power house in course of construction at College Point, L. I., for the American Hard Rubber Company of that place. The power house will be two stories in hight, 40 x 50 ft., and it is said that the order will be closed very shortly.

George F. Hardy, consulting engineer, 309 Broadway, New York, sailed for Europe Wednesday, to marke arrangements for the building of a large pulp mill in Newfoundland, which is to be erected for English capitalists who have formed the Anglo-Newfoundland Development Company, Limited. The company has acquired 2500 square miles of forest land, and its plans include the construction of a number of plants for the making of pulp, paper, &c. It is understood that Mr. Hardy, who will return from Europe in January, will have full charge of the construction work. The plans have not been completely arranged as yet, and it was to confer with his principals regarding the extent of the undertaking that Mr. Hardy went to Europe.

Owing to an error in the pamphlet sent by the Board of Water Supply of New York to contractors, giving information concerning the bids which were to be opened this week for constructing the first part of the Catskill water supply system, it has been decided not to open the bids and to readvertise for new bids. The section of the work affected is 10 miles long.

New England Machinery Market

WORCESTER, MASS., December 4, 1906.

A few advances in prices have been made during the week, notably on boring mills, both vertical and horizontal. The changes are by no means uniform, and it is apparent that the machine tool builders acted independently in the matter. It was announced that arbor presses would be advanced 5 per cent. in a few days, but this should not be considered in the same light as other recent advances, because it is the first for this class of tool for some months. Scattering changes in lists continue to be received by the dealers, always advancing prices, as was to be expected. The volume of business does not diminish in the least with higher prices, deliveries continuing to be the prevailing topic of difference between dealers and manufacturers on the one hand and customers on the other. The talk of another general advance in machine tool prices seems to have died out somewhat during the past week, yet it is frequently heard that

the continued increase in the cost of materials and the condition of the labor market, which is still constantly advancing, will impel manufacturers to make another addition to prevailing market prices.

Certain parts of New England are seriously suffering from lack of freight cars. This especially applies to what may be termed the more remote sections. In one Vermont city a foundry has had to shut down from want of raw materials, it having been found impossible to get the necessary cars.

There is great interest among machine tool builders in the effort being made to secure the appointment by the United States Government of a special commissioner whose duties shall be to look after American machinery interests abroad, especially machine tools. The National Machine Tool Builders' Association has taken up the matter through its executive officers, headed by President E. M. Woodward, and it is confidently hoped that the effort will prove a success. A special United States commissioner appointed to look after the interests of the cotton manufacturers has been of inestimable value to that business, and it is believed that expert services would work out an equal good to the machinery industry, especially to the machine tool business. The Consular reports, while interesting and occasionally of value, do not usually give the information that is really needed. At any rate, it is believed that a special commissioner would do a vastly greater work for the industry. The Department of Commerce and Labor is being urged to take up the question, and members of Congress are the recipients of many letters from the trade asking that they co-operate in securing such legislation and appropriation as may be necessary to the fulfilment of the plan.

The Norton Grinding Company, Worcester, Mass., has begun the putting in of foundations for the large extension of its works which was recently alluded to in this column. It is not determined whether the building itself will be erected this winter, but it is quite probable and at any rate work of construction will begin in the spring. The new building will be a duplicate of the present shop building and will be 86 x 278 ft., one story, with broad gallery surrounding the crane bay, which will be provided with a heavy traveling crane. A building recently erected will connect it at the front with the present shop, and a passageway for an industrial railroad will connect the two crane bays for the easy handling of work. The company is rushed far beyond present capacity with orders for its grinding machines for heavy cylindrical work.

The Hoag Rapid Press Company, San Francisco, will soon begin the construction of a factory building at Hartford, Conn., on a tract of land recently purchased, fronting on Hamilton street. The plans for the building are not fully matured, but it will have a capacity of at least one press a day of the various sizes which it is proposed to manufacture. It will probably be 60 x 150 ft., three stories, with the necessary power plant and all modern facilities for manufacturing. The company will manufacture a new automatic printing press, which turns out perfect work in three colors at the rate of 3240 impressions an hour. Working models have been built at the shops of L. E. Rhodes, Hartford, the first models having been destroyed in the San Francisco disaster. Two presses are now in the Rhodes works. E. J. F. Rea, manager of the Hoag Company, will give out more details of his plans upon his return to Hartford about the first of the year.

The Fairfield Aluminum Foundry Corporation, Southport, Conn., has been organized to manufacture aluminum castings, and has established a foundry for the purpose. The incorporators are John H. Robinson, Bridgeport, manager of the business; W. Herbert Jennings, Fairfield, Conn., treasurer, and Everett E. Bulkeley, Westport, Conn. Mr. Robinson has for nine years been in charge of the foundry of the American Graphaphone Company, Bridgeport. A specialty will be made of castings for automobiles, Government work and other work where severe requirements are to be met.

The Stevens Duryea Company, Chicopee Falls, Mass., manufacturer of automobiles, is to make a large addition to its shops by the erection of a new building, 70 x 112 ft., four stories.

W. C. Price has retired from the Poole & Price Machine Company, 36 Hartford street, Boston, general machinists, and his place in the business has been taken by Harry Pothecary. Mr. Pothecary was with the Brainard Milling Company for 25 years and later with the La Pointe Machine Tool Company.

Frank B. Reynolds, Providence, R. I., is to build a jewelry factory on Niagara street in that city. The building will be 35 x 57 ft., two stories.

The American & British Mfg. Company, Providence, R. I., builder of steam and combustion engines, will proceed immediately with the erection of important additions to its works, formerly the home of the George H. Corliss Engine Company. Large orders for cranes, machine tools and other new equipment will have to be placed in the near future to furnish the new buildings. Each of the buildings will require a 15 and 25 ton electric traveling crane, and a large number of machine tools will be purchased, mostly heavy tools, for the new buildings will be largely devoted to the manufacture of engines of large size. The machinery list has not been prepared, but it will include the usual variety of tools which enter into the equipment of a complete machine shop. One of the two buildings will be approximately 104 x 250 ft., the other 40 x 420 ft. The former building will be a continuation of the present long shop building and the other will join it, extending along one end to form with it a letter T. The long building will extend from the railroad tracks to the foundry and will play an important part in the general plan of extension, of which the beginning is about to be made. Later on a new foundry and a large erecting shop for the Diesel engine department will be built extending from the long building, thus making of it a connecting building between the several departments of the great works. The new buildings will be one story and very high, there being 30 ft. between the crane beams and the floor. The general plan is to add to the crane equipment later on, supplementing the two cranes which will form a part of the original equipment of the building.

H. G. Barr, Worcester, Mass., manufacturer of upright drills, has given the exclusive agency for his products to the Niles-Bement-Pond Company. The Boston office of the company has handled the Barr drills for several years, and now the company will extend the line through its other offices.

The Benedict & Burnham Company, Waterbury, Conn., brass manufacturer, has purchased a tract of land which largely extends its holdings on the Naugatuck River. The company has already under way improvements which will cost $50,000. For several hundred feet a river wall is being built, 10 ft. thick at the base and 16 ft. above low water mark. The wall will inclose a space of the present river bed 60 ft. wide and will constitute one wall of a subterranean chamber, the opposite wall of which is the present embankment. This space, when cemented, will provide storage for 50,000 tons of coal and will form, it is said, the largest underground bin of its kind in the country. The coal chamber will have a modern carrying system, wiith tramway for conveying coal to the boilers. The report is revived that the power plant of the company will provide power for the Holmes, Booth & Hayden Company's works across the river, the two being controlled by the same owner, the American Brass Company. This would mean the building of a viaduct bridge for carrying steam pipes or electric cables.

The Seward Rubber Company, Berlin, Conn., has appropriated $25,000 for additions to its equipment, which will include two independent upright engines of 100 hp. each, a 350-hp. boiler, hose making machine and wrapper, four-roll cylinder, two new mills and a washer. The company manufactures hose, packing, valves, springs, rubber goods for railroad equipment, &c. It has been operating for six months and is already up to its output. Organization has now been effected, with these officers: President, William Seward, Hartford; secretary, William J. Sturgis, Berlin; treasurer, Edgar R. Hopkins, Hartford. The paid-in capital stock is $75,000.

The proposed enlargements of the Bridgeport plant of the American & British Mfg. Company, to increase the department for the manufacture of automobiles, are contingent upon certain negotiations now in progress on a proposition that the company manufacture automobiles complete under contract. Automobile parts have been made at the works for some time, especially frames.

The Osgood Bradley & Sons Company, Worcester, Mass., car builder, does not propose to erect a new plant, as has been several times reported, until the city's grade crossing question reaches the point of taking land for the purpose. The Bradley works are so located that their entire removal will become necessary in connection with the building of a new union station. It may be that next year will see the work begun, in which case the Bradley Company may then have to take the initial steps toward building a complete new plant, which would probably be much larger than that which it now operates. The company's contracts already in hand will keep the works running for close to five years.

An effort is being made at New London, Conn., to organize a company to take over the property of the Eastern Shipbuilding Company, across the river in Groton. The plant has been idle since the completion of the great freighters Dakota and Minnesota, which were built for the system of railroads and steamships controlled by James J. Hill. The present owner is the Bethlehem Steel Company. It is stated at New London that Charles R. Hanscom, who was the head of the company that operated the shipyard, is negotiating for the purchase of the property, and if New London people will take a sufficient amount of stock in the enterprise the business will be resumed. As the matter now stands options on machinery of the plant have been given to owners of other works, and unless immediate success attend the new plan it is presumed that the shipyard will be permanently closed.

The Stetson shipyard at Bangor, Maine, recently purchased by John T. Bowler and George H. Hamlin, will for the present be carried on under the management of E. P. Mayo, who has been in the office of E. & I. K. Stetson for

the past 20 years. The new owners are not ready to state their plans for the improvements which seem to be indicated by their purchase of a large additional river frontage in connection with the yard.

Chicago Machinery Market.

CHICAGO, ILL., December 4, 1906.

Notwithstanding the heavy expenditures made this year by Western and Northwestern roads for shop extensions and equipment additions, there is more prospective work on the boards of both merchant and railway engineers than at any time in the past two years, and which will ultimately entail equipment purchases easily amounting to $2,000,000. One engineering firm in this city which makes a specialty of designing and erecting railway shops and power plants has contracts on its books involving expenditures amounting to $8,000,000. This indicates that there will be no retrenchment on the part of either steam or electric roads during 1907, the new shops in almost every instance having become necessary owing to the tremendous additions to rolling stock which have greatly increased repairs, while larger and more powerful locomotives have presented new problems in the repair shops which are usually solved by the replacement of tools of obsolete types with those of modern design. It has been stated on reliable authority that the railroads can show average profits from their shops amounting to 15 per cent., and as high as 20 per cent. has been netted from plants of modern design and equipment. For new shops at Beech Grove, Ind., a suburb of Indianapolis, the Big Four has made an appropriation of $1,500,000 to be expended next year, and it is estimated that $500,000 additional will be required before the work is completed. The Arnold Company of this city is now awarding contracts for the power equipment, but the machine tool purchases are in the hands of a committee of the company's engineers and it is doubtful if the list can be promulgated before the first of the year. Although some machines will be removed from shops that will be abandoned, nevertheless the total requirements promise to be larger than any that have been presented to the machine tool trade in the past two years. Although plans for the Grand Trunk shops at Battle Creek, Mich., have not yet been finally passed upon, their total cost has been estimated at over $2,000,000. The question of tools and general equipment has not yet been considered, but it is certain that the list will be of large proportions. Contracts for the machines that will be installed in the extensions to the Chicago & Eastern Illinois shops at Danville, Ill., will be placed through the company's purchasing department in this city, but will not be available to the trade for a month at least.

The new plant of the Standard Steel Car Company, Pittsburgh, Pa., which will be erected at Hammond, Ind., will be the largest car plant in the West and will have a daily capacity of 100 steel and wooden cars. The contract for the erection of the buildings was awarded the McClintic-Marshall Construction Company, Pittsburgh, some time ago, and includes the following structures: Steel car shop, 160 x 2000 ft.; truck shop, 80 x 600 ft.; wood car shop, 80 x 1800 ft.; paint shop, 80 x 1500 ft.; planing mill, 80 x 800 ft., and power house, 80 x 800 ft. A number of smaller buildings will also be erected, contracts for which have not yet been let. Equipment is being purchased at Pittsburgh.

The Zilberzahn Gas Engine Company has been organized at Marinette, Wis., for the manufacture of gas engines. The company is capitalized at $10,000, one-fourth of which is subscribed by citizens of Marinette and the balance by John and Louis Zilberzahn. C. R. Johnston is president; John Zilberzahn, vice-president; Louis Zilberzahn, secretary, and Fred. Burke, treasurer. It has been practically decided to establish a foundry in the old iron works at Marinette and to not only make its own castings, but to do heavy work for outside firms.

The Fred. M. Prescott Steam Pump Company, Milwaukee, has received an order from the Union Electric Light & Power Company, St. Louis, through its president, John I. Beggs, for what will be the largest boiler feed pump ever manufactured. It will be nearly 30 ft. in length and weigh approximately 80,000 lbs. It will feed from 50,000 to 60,000 hp., and if used as a water works pump it would have a capacity sufficient to supply a city of 40,000 people. Instead of the ordinarily simple steam cylinders, this pump will have compound steam cylinders and run condensing. It will have two high pressure cylinders, 18 in. in diameter; two low pressure, 34 in. in diameter; water plungers, 17 in. in diameter, all with a common stroke of 24 in. The Prescott Company has also furnished the pumps and condensing apparatus for the new Commerce street power plant of the Milwaukee Electric Railway & Light Company, Milwaukee.

The Reliance Machinery & Supply Company, New Orleans, La., has been organized to engage in the sale of sawmill machinery and mill supplies, and has opened a store and warehouse at 431-433 Gravier street. The company will represent the following manufacturers: The Chicago Belting Company, Chicago, leather belting; the Gutta Percha & Rubber Mfg. Company, New York, rubber belting, hose and packing; the Matteson Mfg. Company, Chicago, Ill., filing room machinery. Charles Allis is president; E. J. Marks, vice-president; E. H. Ball, secretary, and C. H. Hartman, treasurer.

Philadelphia Machinery Market.

PHILIDELPHIA, PA., December 4, 1906.

The volume of business transacted in the local machinery market the past month compares very favorably with that done in November, 1905, and while not as large in every case as that done in October, it was on the whole quite a satisfactory month's business. In some few instances dealers as well as manufacturers booked several fairly large orders. As a rule, however, sales were confined to small lots, the majority being for single tools, which in the aggregate reached a good total. The demand has not been confined to any particular line or grade of tools. Heavy tools, however, have not had an extensive sale, most of the business being for tools of the medium weights. Special tools of all classes have had a good sale, as has also power transmission machinery.

There appears to be but little diminution in the number of inquiries before the trade. There is no doubt, however, that there is a large amount of duplication, as inquiries are frequently sent to a larger number of both tool builders and merchants than would be customary under ordinary conditions, in the hope that from some one or other there might be a possibility of an early delivery on the tool sought. In this buyers are frequently disappointed, and the delay in placing orders and frequently the decision to defer placing orders for the time being are traceable in most cases to the inability to obtain the deliveries as early as the customer desires. The greater portion of the business before the trade is confined to single tools and to small lots for replacement and minor extension. Large specifications are noticeably absent, and the trade does not expect any heavy closing of new business until after the turn of the year. Tool builders have as much and in some cases more business on their books than can be well taken care of. While orders may not be as heavy at the time, the possibility of turning out a full production decreases. December, as a rule, is not a heavy production month, the holidays interfering in this respect to a large extent. The inability to get raw materials promptly, as well as the scarcity of good mechanics, hinders production materially, and there appears to be little chance in the near future for any improvement in this respect.

The foreign demand remains unchanged. In some lines of special tools some good orders for export have been booked, while but little business has been taken for the standard line of machine tools. There has been some inquiry recently for a fair lot of tools for export, but the orders have not yet been forthcoming, as deliveries are understood to be unsatisfactory. The month's business in special equipment for power transmission machinery has been good, and those transacting an established business abroad in shop specialties report sales in seasonable quantities.

The demand for boilers and engines is only fair. Inquiries seem to be in good number, but difficulty is experienced by both builders and merchants in closing up the business under consideration. The demand for heavy power equipment has not been large locally, although for medium and the lower horsepowers there appears to be a good city trade. Second-hand boilers and engines have not been as active, particularly in the larger capacities, while sales of the smaller powers are offset to a great extent by the sale of gas and gasoline engines. If dealers in second-hand machinery and machine tools could get the equipment desired by the trade they would have no difficulty in making sales. Inquiries for second-hand equipment have been heavy, but tools such as are generally desired are scarce. Standard tools of almost every class, of somewhat recent make and in good order, are sought after by prospective buyers, and when offered by dealers are as a rule quickly sold.

Iron and steel casting plants continue booking a large amount of business, probably the largest aggregate tonnage in the history of the trade. Deliveries show no indication of improvement. Raw materials are hard to obtain promptly, even at advanced prices, and many of the foundries could produce larger tonnages could a better supply of molders be had. Machinery manufacturers continue to complain about delayed deliveries of castings, but there is nothing in sight to indicate an early improvement of this condition.

Dodge & Day, engineers, report a good demand for the modernization of industrial plants, and several new propositions are under consideration. These, however, are not likely to develop into actual commissions until after the turn of the year, and in that case would hardly be started upon until after the winter season. The work on the new plant of the Bridgeport Brass Works is progressing favorably. An extensive pile driving outfit is being transferred to that point, in order that the work may be started on the foundations for the building.

The High Duty Saw & Tool Company, Eddystone, Pa., has recently taken an order for six No. 1 Paragon cold sawing machines, equipped with Tindel high duty saws, for one concern, and has installed a No. 3 Paragon machine at the Industrial Works, Bay City, Mich., and another of the same size at the Philadelphia plant of Wm. Wharton, Jr., & Co., Incorporated. The former machine was equipped with a 38-in. and the latter with a 36-in. saw. The demand for these machines, as well as for saw blades, is increasing rapidly, and the books of the company are well filled with orders. A number of the saw blades have also been shipped for export during the past month.

J. H. Johnson, Jr., & Co., Incorporated, reports shipments of lathes the past month fully up to the average. Several heavy lathes have been delivered, but the bulk of the shipments have been made up of medium and smaller tools, which have been furnishd customers in various sections of the country. Inquiries keep up satisfactorily, and the number of orders booked has been even larger than the average. All departments of the plant are fully occupied and work enough is on hand to keep them so for months ahead.

The Baldwin Locomotive Works has recently shipped for export 10 10-wheel consolidation freight and 10 10-wheel passenger engines for an Italian railroad, also 12 locomotives of different types for various buyers in Cuba. This company has taken on orders for a large number of engines, both for railroads and for industrial concerns. Every department of its plant is working at full capacity, and shipments have in some cases been delayed by the inability to get deliveries of raw materials promptly. The making of gray iron castings at the local plant has been discontinued, all the work now being done at the Eddystone foundry, which is rapidly nearing completion. The local foundry building has been torn down, and the erection of the new erecting shop on its site has begun. This shop will be used when completed more particularly for the erection of locomotives for the export trade.

The Tindel-Morris Company, Eddystone, Pa., is busy in every department. Orders for Tindel-Albrecht crank shaft lathes have been numerous and fairly prompt delivery has been maintained on this line of lathes. A 17-in. lathe of this type has recently been furnished the Anderson Forge & Machine Works, Detroit, Mich., while a 32-in. lathe is building for the Union Pacific Railway Company. Estimates for these lathes in 42 and 60 in. sizes are now being made for another Western concern. The forging department of the Tindel-Morris Company is very busy on a large and varied assortment of work, and the order books are so filled with specifications that every department will be fully occupied for a long time.

Cincinnati Machinery Market.

CINCINNATI, OHIO, December 4, 1906.

From all appearances the closing month of the year will compare favorably with almost any of its predecessors, and will probably show the year, taken as a whole, to have been the largest the machine tool interests ever experienced. Export business continues strong, and the increased demand from sections of our own country hitherto little known in this way has shown remarkable development. When it is noted that deliveries are any way from three months to a year behind, although a large number of the plants have materially increased their capacities during the year, some idea is obtained of the tremendous movement of trade that has kept pace with the months as they have rolled by.

The second annual excursion of the Industrial Bureau was given November 27, about 200 attending. The party was taken by special train to the Chas. Boldt Glass Company at Linwood, where an inspection of the plant was made. The next stop was made at the plant of the L. Schreiber & Sons Company at Norwood. This company moved to Norwood some two years since, on a site of 14 acres, about half of which is covered by buildings, with others in the course of construction. About a year since, it will be remembered, this company suffered a serious loss by fire to its Eggleston avenue plant, and the work on the new site was pushed along as rapidly as possible. The power house, which is of brick, 90 x 90 ft., is equipped with two 150-hp. Babcock & Wilcox tubular boilers, while another of 250 hp. is being installed for supplying live steam for heating. The power is furnished by one 135-kw. Jantz & Leist and one 185-kw. Bullock generator, driven by Skinner automatic engines. This building is also equipped with one Laidlaw-Dunn-Gordon air compressor, which furnishes air for the shops at about 60 lb. pressure. Immediately on the outside of this building is a cistern of 100,000 gal. capacity, which is used in connection with the city water, which is carried by a special line of pipe for 2000 ft. Next to this is the pattern shop, 60 x 180 ft., where all the machinery is electrically driven. The shop is well lighted from the north, giving an even light both winter and summer. The modeling shop, which is a branch of the pattern shop and adjoins it, is used for clay modeling for the highly decorative work. The pattern storage room, which is also 60 x 180 ft., is situated east of the modeling shop. Here are stored all patterns which are kept as standard, arranged in three tiers of galleries, which are again also subdivided into smaller branches and catalogued. The next building is the foundry, which is 115 x 200 ft. This is equipped with one 15-ton and one 10-ton traveling crane. A branch of this foundry is the bronze foundry, where all brass and bronze castings are made. This is equipped with natural gas furnaces and a 3-ton hand crane. The cast iron fitting department is 115 x 175 ft. Here all fitting of cast iron store fronts is done, and the heavier class of cast iron building work which is too heavy for handling in the ornamental iron fitting department proper is taken care of. A new fan house, about 40 ft. square, is now in course of construction. This is to house a 14-ft. Sturtevant fan and heater for supplying the present ornamental iron building and a future structural building with heat, conducted through a 5-ft. concrete conduit underground. The ornamental iron building is 70 x 400 ft., with a gallery on one side. In this building is finished all the finer grade of ornamental ironwork, stairs, elevator inclosures, bank screens, &c., made in bronze and iron. This building is equipped with a 10-ton Case electric crane, all machinery being electrically driven. The structural department, which is now on Eggleston avenue, Cincinnati, will in the near future be moved to the new site, where a building 115 x 400 ft. will be erected to receive it. With this improvement the capacity of the plant will be about 2000 tons of structural material per month.

A visit to the Bullock plant of the Allis-Chalmers Company revealed the fact that the shops are crowded with work, all available space being occupied with machinery or material under construction. This congestion will be much relieved in a short time, when the heavier work will be done by the shops at West Allis, Wis., leaving this branch for handling lighter work exclusively. This plant was established eight years since, occupies 17½ acres of ground, and has 1800 employees. The annual output is stated to be about 15,000 tons of finished product.

In *The Iron Age* of November 15 reference was made to the Precision Tool & Development Company, Cincinnati, which in some respects was erroneous, in that the company's president is not now the South American representative of the Blymer Iron Works. The enterprise has been established for the purpose of making special machinery, such as dies and high grade tools on order, and in the near future will develop several specialties not yet made public. The premises at 2125 Colerain avenue have been secured, in which the necessary tools are now being installed. The plant is expected to be in full operation within 30 days.

The Central Foundry Company, Hamilton, Ohio, with $25,000 capital, has been incorporated by John T. Gardner, W. L. Huber, C. O. Margedant, A. Margedant and W. C. Margedant.

Government Purchases.

WASHINGTON, D. C., December 4, 1906.

The Superintendent of the United States Capitol, Washington, D. C., will receive bids until December 26 for the first section of the work for the installation of the power and heating plant, including the engines, boilers, generators, pumps, condensers and other apparatus. Proposals for other machinery for the plant will be issued later.

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until December 18 for motors, electric grinders, pneumatic drills, punches, feed pumps and other supplies for the Eastern navy yards.

The Isthmian Canal Commission will receive bids until December 17, Circular No. 342, for pumps and other supplies.

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until January 15 for one engine lathe.

The following bids were opened November 27 for supplies for the navy yards:

Bidder 9, The Bridgeport Safety Emery Wheel Company, Bridgeport, Conn.; 14, The Brown & Sharpe Mfg. Company, Providence, R. I.; 18, The Crane Company, Chicago, Ill.; 27, The Drew Machinery Agency, Manchester,

N. H.; 34, The Walter H. Foster Company, New York; 37, The A. D. Granger Company, New York; 41, R. W. Geldart, New York; 43, Hill, Clark & Co., Boston, Mass.; 44, The Handlan-Buck Mfg. Company, St. Louis, Mo.; 49, The Jones & Lamson Machine Company, Springfield, Vt.; 64, Motley, Green & Co., New York; 67, The Manhattan Supply Company, New York; 69, Manning, Maxwell & Moore, New York; 70, Montgomery & Co., New York; 72, The Niles-Bement-Pond Company, New York; 76, The New Jersey Foundry & Machine Company, New York; 78, The Phœnix Iron Company, Meadville, Pa.; 79, The S. W. Price Machinery Company, Norfolk, Va.; 84, The Ricketts Engineering Company, Washington, D. C.; 85, J. B. Roache, Brooklyn, N. Y.; 89, The Sherman-Brown-Clements Company, New York; 104, Vermilye & Power, New York; 115, The Prentiss Tool & Supply Company, New York.

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Schedule No. 244.

Class 51. One 12-spindle motor driven drill—Bidder 115, $2375.

Class 52. One motor driven pipe cutting machine—Bidder 18, $680.35; 27, $1268; 43, $1265; 69, $1245; 72, $1025; 84, $235; 104, $396.

Schedule No. 254.

Class 74. Twenty-five hydraulic jacks—Bidder 41, $924.30; 44, $899.50; 67, $929; 69, $896; 70, $970; 79, $897.50; 85, $854.75; 89, $899; 104, $976.65.

The Robins Conveying Belt Company, New York, has been awarded contract for constructing the naval coaling plant at Guantanamo, Cuba, at $57,800.

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The Pratt & Whitney Company, Hartford, Conn., class 32, one bench drill, $31; class 33, one bench lathe, $1005.

The Fairbanks Company, New York, class 21, one planing machine, $4498.

The Deane Steam Pump Company, Philadelphia, Pa., class 22, two motor driven pumps, $9955.

Manning, Maxwell & Moore, New York, class 31, one twist drill wet grinder, $190; class 36, one universal sectional hydraulic flanging press, $4100.

The Detrick & Harvey Machine Company, Baltimore, Md., class 35, one horizontal boring, drilling and milling machine, $3250.

The North Penn Iron Company, Philadelphia, Pa., class 37, one three-motor electric traveling crane, $3125.

The Ingersoll-Rand Company, New York, class 41, one improved pneumatic artesian well pump, $2226.

The Northern Electrical Mfg. Company, Madison, Wis., class 104, eight 3-kw. motor generators, $3540.48; class 105, eight 3-kw. motor generators, $3504; class 106, four 25-kw. motor generators, $5020.82; class 107, four 25 kw. motor generators, $4942.38.

The General Electric Company, Schenectady, N. Y., class 152, two 50-hp. motors, $1672.

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The Pacific Tool & Supply Company, San Francisco, Cal., class 1, one toolroom lathe, $950.

The Hallidie Machinery Company, Seattle, Wash., class 62, one twist drill grinder and one cutter grinder, $243.75.

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Machinery.—A. B. Farquhar Company, Limited, York, Pa. Fiftieth annual catalogue. Size, 8½ x 11¼ in.; pages 72. Illustrates and describes the company's line of portable, semi-portable and stationary engines and boilers, traction engines, vertical engines and boilers, horizontal return tubular boilers, saw mills, shingle mills, cut-off saws, vibrator and rake separators, self-feeders, wind stackers and rice threshers.

Industrial Railways.—C. W. Hunt Company, West New Brighton, Staten Island, New York. Pamphlet No. 064. Shows installations of Hunt industrial railways in various manufacturing plants, and illustrates the different kinds of tracks and the numerous styles of cars made by the company. The descriptive matter explains the advantages claimed for these railways.

Hoisting Engines.—Wellman-Seaver-Morgan Company, Cleveland, Ohio. Circular No. HO-7. Size, 6 x 9 in.; pages, 32. Devoted to the company's larger sizes of steam-operated geared hoists, including the Ibex, Sierra and Compound types. The descriptions are complete and are supplemented by tables of various sizes and styles. A list of parts of the Akron standard Corliss engines is appended.

Grinding Machinery.—Clizbe Bros. Mfg. Company, Plymouth, Ind. Catalogue. This lists the company's line of bench, floor, foot power, disk, hand, sickle and kitchen grinders, countershafts and columns, saw gummers, polishing heads, emery and polishing wheels, emery and glue, emery wheel dressers, lawn mower sharpeners, oil stones and hones, scythe stones, axe stones, slips and knife polishing machines.

Lathes.—Gisholt Machine Company, Madison, Wis. Page 55 for insertion in loose leaf catalogue. Pertains to the 24-27 in. and the 24-32 in. American semi-automatic turret lathes, the latter being a gap machine.

Vises.—Pittsburgh Automatic Vise & Tool Company, Pittsburgh, Pa. Catalogue. Gives illustrations and specifications of iron workers', double swivel, self-adjustable vises, woodworkers' vises, pipe vises, single swivel vises, railroad or heavy chipping vises, automobile vises and jewelers' and experimental vises. Sectional views of these are also given.

Pumps.—W. & B. Douglas, Middletown, Conn. Booklet E. Deals with electrically driven pumping outfits of the belted, geared and direct-connected types, which can be obtained for operation in either vertical or horizontal positions. Some advantages of using electric pumps are explained, and prices and dimensions are given in a tabular form.

Electrical Apparatus.—Stanley-G. I. Electric Mfg. Company, Pittsfield, Mass. Bulletin and circulars. Bulletin No. 609, superseding bulletins Nos. 25 and 194, is devoted to the G. I. water-tight, adjustable floor outlet box, the P. R. floor outlet box, and the G. I. seamless wall outlet box. Circular No. 786 deals with the type K-31, K-41, K-22, K-23 and K-33 arc lamps, which have been recently placed on the market. Circular No. 787 pertains to direct current motors and generators.

Marine Motors.—Caille Perfection Motor Company, 1300-1340 Second avenue, Detroit, Mich. Catalogue. Deals with the Perfection marine motors, for which special advantages are claimed. The 1½, 2, 2½, 3 and 6 hp. motors are illustrated, and descriptive matter gives the dimensions and prices of the motors. The reversing and speed control and other parts of the motors are dealt with separately.

Valves, Traps and Water Columns.—Golden-Anderson Valve Specialty Company, Fulton Building, Pittsburgh, Pa. November circular. Illustrates and describes the Anderson automatic and counterbalanced valve, water column, float valve, flexible spout stand pipe, altitude valve and Ideal strainer and fish trap, and also the Golden clean seat valve and the high and low pressure tilting steam trap.

Graphite Cups.—Comstock Engine Company, 49-61 Clymer street, Brooklyn, N. Y. Pamphlet. Describes the Graphoil steam cylinder graphite cups, which can be connected with any standard sight or force feed steam cylinder lubricator, and delivers graphite to the cylinder with each drop of oil. This cup is claimed to feed the graphite automatically, constantly and regularly, but will not feed too much graphite.

Boiler Makers' Specialties.—A. L. Henderer's Sons, Wilmington, Del. Catalogue. Size 6¼ x 9¼ in.; pages 27. This supersedes the previous catalogue, and pertains to hydraulic jacks and punches, tube expanders, pipe vises, screw punches and pumps. The various classes of these are illustrated and dimensions and prices are given in a tabulated form. A circular deals with malleable iron pipe vises, also made by this firm.

HARDWARE

THE desirability of the expansion of our trade relations with South America is universally acknowledged and the recognition of the force of the arguments recently adduced by Secretary Root has been on this account general and sincere. While there may be some difference of opinion in regard to some of the Governmental methods advocated by him with a view to promoting our foreign, and especially the South American, trade, there can be no exception taken to the following statement, making the point that individual effort is, after all, the essential thing, and that no legislation or action by Congress can take its place:

> To utilize this opportunity certain practical things must be done. For the most part these things must be done by a multitude of individual efforts; they cannot be done by Government. Government may help to furnish facilities for the doing of them, but the facilities will be useless unless used by individuals; they cannot be done by resolutions of this or any other commercial body; resolutions are useless unless they stir individual business men to action in their own business affairs. The things needed have been fully and specifically set forth in many reports of efficient consuls and of highly competent agents of the Department of Commerce, and they have been described in countless newspapers and magazine articles; but all these things are worthless unless they are followed by individual action.

In the light of this cardinal principle, thus plainly set forth, it is for each manufacturer to find a way for his wares into these foreign fields. It may be through commission houses which are in a position to serve him and have facilities more or less ample and adequate, or, if his interests are large enough, by the more efficient method of sending a direct representative who will give personal attention to the introduction of his products. Where this is not possible something may be accomplished by persons who visit the South American markets as the representatives of several manufacturers, or by the establishment of resident agencies as the way opens here and there in the more important centers. There are also many instances in which by judicious correspondence valuable accounts have been opened and channels thus found for a large and permanent outgo of a manufacturer's goods. The essential point is that each manufacturer must look at the problem as coming to him with its summons to individual effort if he has any ambition to secure the trade in question. It is, indeed, by the aggregate of such efforts that the country's foreign trade is to be built up. While each manufacturer thus sows the seed for what will be, it may be hoped, an ample harvest for himself, he may have the satisfaction of knowing that he is contributing directly to the welfare of the country and its success in occupying foreign fields which cannot be secured and cultivated in any other way.

It is unnecessary to emphasize the importance of this principle as applied to the position and prosperity of the retail merchants of the country. There is, broadly speaking, the opportunity for the sale of an increasing quantity of goods and the establishment of larger trade relations. The domestic as well as the foreign field is still far from being cultivated as it might be. There is, as it were, a continent to be possessed by our merchants, ground soon to be occupied by some one, for there are energetic competitors looking for the extension of their business. All the machinery of distribution is available. It must, however, be worked and worked by individuals. There are difficulties and obstacles to be overcome. There is no royal road to a large and profitable trade. Here, as abroad, it is a question of individual effort. The merchant energetically and wisely seeking larger markets will find them, and the measure of his success will depend, other things being equal, upon the measure of his energy and wisdom. He cannot expect Congress or his association or any organization or movement to make him a successful merchant and to give him a profitable and an enlarging business. In the last analysis everything depends upon himself.

Condition of Trade.

The year draws to a close with a continuance of the marked activity and strength which have characterized the market for some time. Advances in price are a notable feature of the situation, and within a few weeks they have been perhaps more frequent than before, as a great many lines are being affected by the increased cost of material and the demand for goods which with few exceptions overtaxes the capacity of the factories. Many manufacturers are of course working on the basis of raw material purchased at lower prices than now prevail and are sometimes withholding announcements of advances in their products until obliged to purchase material at the higher prices now ruling. One of the problems for merchants, both wholesale and retail, is to keep their selling prices in harmony with the market, but a great many are unquestionably selling on the basis of the cost of the goods at the lower figures at which they were purchased. As a result of this practice many jobbers are selling goods at prices closely approximating the manufacturers' present price to them, giving their customers so long as the stock holds out the benefit of what may be termed cut prices. Retail merchants, too, are undoubtedly slow in marking up their goods. In both cases the labor involved of changing prices on a miscellaneous stock is very considerable. The difficulty may be illustrated by the case of a prominent Eastern retail house, which in view of the perplexity and difficulty of the work, for which indeed in the pressure of business it was hard to find time, gave the general direction in regard to the great mass of Shelf goods especially, that prices were to be considered advanced 10 per cent. without the formality of changing the marking on the various shelf boxes, price cards, &c. There is also some difficulty in obtaining goods, nearly all the manufacturers being in fact behind their orders, while jobbers' stocks are showing many gaps in assortments. There is also much delay in connection with transportation, and this adds not a little to the difficulty experienced by both manufacturers and merchants at this time. Holiday trade is occupying a good share of attention, but notwithstanding the pressure of business something of a holiday spirit is beginning to make itself manifest.

Chicago.

There has been no appreciable decline in the volume of trade throughout this section despite the approach of the holidays, and the indications are favorable to well

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Lathes.—Gisholt Machine Company, Madison, Wis. Page 55 for insertion in loose leaf catalogue. Pertains to the 24-27 in. and the 24-32 in. American semi-automatic turret lathes, the latter being a gap machine.

Vises.—Pittsburgh Automatic Vise & Tool Company, Pittsburgh, Pa. Catalogue. Gives illustrations and specifications of iron workers', double swivel, self-adjustable vises, woodworkers' vises, pipe vises, single swivel vises, railroad or heavy chipping vises, automobile vises and jewelers' and experimental vises. Sectional views of these are also given.

Pumps.—W. & B. Douglas, Middletown, Conn. Booklet E. Deals with electrically driven pumping outfits of the belted, geared and direct-connected types, which can be obtained for operation in either vertical or horizontal positions. Some advantages of using electric pumps are explained, and prices and dimensions are given in a tabular form.

Electrical Apparatus.—Stanley-G. I. Electric Mfg. Company, Pittsfield, Mass. Bulletin and circulars. Bulletin No. 609, superseding bulletins Nos. 25 and 194, is devoted to the G. I. water-tight, adjustable floor outlet box, the P. R. floor outlet box, and the G. I. seamless wall outlet box. Circular No. 786 deals with the type K-31, K-41, K-22, K-23 and K-33 arc lamps, which have been recently placed on the market. Circular No. 787 pertains to direct current motors and generators.

Marine Motors.—Caille Perfection Motor Company, 1300-1340 Second avenue, Detroit, Mich. Catalogue. Deals with the Perfection marine motors, for which special advantages are claimed. The 1½, 2, 2½, 3 and 6 hp. motors are illustrated, and descriptive matter gives the dimensions and prices of the motors. The reversing and speed control and other parts of the motors are dealt with separately.

Valves, Traps and Water Columns.—Golden-Anderson Valve Specialty Company, Fulton Building, Pittsburgh, Pa. November circular. Illustrates and describes the Anderson automatic and counterbalanced valve, water column, float valve, flexible spout stand pipe, altitude valve and Ideal strainer and fish trap, and also the Golden clean seat valve and the high and low pressure tilting steam trap.

Graphite Cups.—Comstock Engine Company, 49-61 Clymer street, Brooklyn, N. Y. Pamphlet. Describes the Graphoil steam cylinder graphite cups, which can be connected with any standard sight or force feed steam cylinder lubricator, and delivers graphite to the cylinder with each drop of oil. This cup is claimed to feed the graphite automatically, constantly and regularly, but will not feed too much graphite.

Boiler Makers' Specialties.—A. L. Henderer's Sons, Wilmington, Del. Catalogue. Size 6¼ x 9¼ in.; pages 27. This supersedes the previous catalogue, and pertains to hydraulic jacks and punches, tube expanders, pipe vises, screw punches and pumps. The various classes of these are illustrated and dimensions and prices are given in a tabulated form. A circular deals with malleable iron pipe vises, also made by this firm.

HARDWARE

THE desirability of the expansion of our trade relations with South America is universally acknowledged and the recognition of the force of the arguments recently adduced by Secretary Root has been on this account general and sincere. While there may be some difference of opinion in regard to some of the Governmental methods advocated by him with a view to promoting our foreign, and especially the South American, trade, there can be no exception taken to the following statement, making the point that individual effort is, after all, the essential thing, and that no legislation or action by Congress can take its place:

> To utilize this opportunity certain practical things must be done. For the most part these things must be done by a multitude of individual efforts; they cannot be done by Government. Government may help to furnish facilities for the doing of them, but the facilities will be useless unless used by individuals; they cannot be done by resolutions of this or any other commercial body; resolutions are useless unless they stir individual business men to action in their own business affairs. The things needed have been fully and specifically set forth in many reports of efficient consuls and of highly competent agents of the Department of Commerce, and they have been described in countless newspapers and magazine articles; but all these things are worthless unless they are followed by individual action.

In the light of this cardinal principle, thus plainly set forth, it is for each manufacturer to find a way for his wares into these foreign fields. It may be through commission houses which are in a position to serve him and have facilities more or less ample and adequate, or, if his interests are large enough, by the more efficient method of sending a direct representative who will give personal attention to the introduction of his products. Where this is not possible something may be accomplished by persons who visit the South American markets as the representatives of several manufacturers, or by the establishment of resident agencies as the way opens here and there in the more important centers. There are also many instances in which by judicious correspondence valuable accounts have been opened and channels thus found for a large and permanent outgo of a manufacturer's goods. The essential point is that each manufacturer must look at the problem as coming to him with its summons to individual effort if he has any ambition to secure the trade in question. It is, indeed, by the aggregate of such efforts that the country's foreign trade is to be built up. While each manufacturer thus sows the seed for what will be, it may be hoped, an ample harvest for himself, he may have the satisfaction of knowing that he is contributing directly to the welfare of the country and its success in occupying foreign fields which cannot be secured and cultivated in any other way.

It is unnecessary to emphasize the importance of this principle as applied to the position and prosperity of the retail merchants of the country. There is, broadly speaking, the opportunity for the sale of an increasing quantity of goods and the establishment of larger trade relations. The domestic as well as the foreign field is still far from being cultivated as it might be. There is, as it were, a continent to be possessed by our merchants, ground soon to be occupied by some one, for there are energetic competitors looking for the extension of their business. All the machinery of distribution is available. It must, however, be worked and worked by individuals. There are difficulties and obstacles to be overcome. There is no royal road to a large and profitable trade. Here, as abroad, it is a question of individual effort. The merchant energetically and wisely seeking larger markets will find them, and the measure of his success will depend, other things being equal, upon the measure of his energy and wisdom. He cannot expect Congress or his association or any organization or movement to make him a successful merchant and to give him a profitable and an enlarging business. In the last analysis everything depends upon himself.

Condition of Trade.

The year draws to a close with a continuance of the marked activity and strength which have characterized the market for some time. Advances in price are a notable feature of the situation, and within a few weeks they have been perhaps more frequent than before, as a great many lines are being affected by the increased cost of material and the demand for goods which with few exceptions overtaxes the capacity of the factories. Many manufacturers are of course working on the basis of raw material purchased at lower prices than now prevail and are sometimes withholding announcements of advances in their products until obliged to purchase material at the higher prices now ruling. One of the problems for merchants, both wholesale and retail, is to keep their selling prices in harmony with the market, but a great many are unquestionably selling on the basis of the cost of the goods at the lower figures at which they were purchased. As a result of this practice many jobbers are selling goods at prices closely approximating the manufacturers' present price to them, giving their customers so long as the stock holds out the benefit of what may be termed cut prices. Retail merchants, too, are undoubtedly slow in marking up their goods. In both cases the labor involved of changing prices on a miscellaneous stock is very considerable. The difficulty may be illustrated by the case of a prominent Eastern retail house, which in view of the perplexity and difficulty of the work, for which indeed in the pressure of business it was hard to find time, gave the general direction in regard to the great mass of Shelf goods especially, that prices were to be considered advanced 10 per cent. without the formality of changing the marking on the various shelf boxes, price cards, &c. There is also some difficulty in obtaining goods, nearly all the manufacturers being in fact behind their orders, while jobbers' stocks are showing many gaps in assortments. There is also much delay in connection with transportation, and this adds not a little to the difficulty experienced by both manufacturers and merchants at this time. Holiday trade is occupying a good share of attention, but notwithstanding the pressure of business something of a holiday spirit is beginning to make itself manifest.

Chicago.

There has been no appreciable decline in the volume of trade throughout this section despite the approach of the holidays, and the indications are favorable to well

sustained activity through the first half of this month. In the Wire trade the month has opened with a heavy demand for Nails and other Wire products with the exception of Barb Wire, this unreasonable activity being attributed to the weather conditions which have permitted building operations to be carried on without interruption. Mill shipments are improving slightly, although Cut Nail makers are suffering from a shortage of raw materials. The withdrawal from the market of several manufacturers of Wire Cloth reflects the heavy buying since prices were announced, although there are indications of reservations by some makers in anticipation of higher values. Building operations in Chicago for November show a falling off in cost as compared with the same month a year ago, although the total for the first 11 months involves $61,138,680, against $57,754,870 in the same period last year.

St. Louis.

NORVELL-SHAPLEIGH HARDWARE COMPANY.—The seasons lap—along with orders for Stoves and Skates come others for Wire Cloth and Screen Doors. As they say in Wall street, the situation on staple spring lines is in "strong hands." Wisely handled by the manufacturers and properly supported by the jobbers, this makes for a steady and certain market. Further advances are promised. Therefore it will stand the retail dealer in hand to place his orders on spring lines promptly.

October was our record month in volume of sales this year; November was a close second. October was an almost ideal month from start to finish for selling goods. In November, first we had the elections, dealers talked politics, they were interested in the papers, salesmen went home to vote. Then came heavy rains in a large part of our territory, with impassable roads. Next comes Thanksgiving, and, last, November had one less working day than October. Considering these handicaps November made a very good showing. On Friday following the Thanksgiving holiday we received the largest number of orders of any day in our history. The large number of mail orders direct from our customers is a feature of our business. The prosperity of the times is indicated by the kind and character of goods called for. The retail Hardwareman is evidently paying more attention to Christmas business; he is putting to the front the many useful articles in the Hardware line that are suitable as holiday gifts. An unusually good Christmas business is anticipated this year.

Salesmen all over the country are now planning their attacks upon the treasuries of their houses; they want their share of the prosperity. Most salesmen this year have made good records; with the great majority it no doubt has been their banner year. Happy are the men who are working on a plan by which, in addition to their fixed salaries, they also enjoy a profit sharing arrangement, which compensates them for the hard and successful work they have done this year.

The successful salesman makes many personal sacrifices, he gives up many of the joys and comforts of family life. He deserves a large measure of compensation for his efforts. It must be remembered, however, this has been an unusual year, conditions for the selling of goods having been very favorable. Almost every salesman of fair intelligence who was willing to work hard has done well.

Salesmen with common sense must appreciate the fact that houses would be very unwise to give them flat salaries based on the results of such an unusually prosperous year as 1906. Such times as these, in the nature of the case, cannot continue. In our opinion the first time there is a short crop there will be a reaction. This nation is governed largely by sentiment; we are almost as volatile as the French; we need some of the phlegmatic disposition of the German. Let the word once be passed down the line that hard times have come and then all of us will quit buying, and most of us will have on hand a surplus of things to use and to wear that will last a long time.

Therefore it seems to us while those who are in charge of the making of salaries should be just as gen-

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erous as circumstances will allow in paying bonuses or extra compensation to salesmen and to house employees on the satisfactory results of 1906, they should be exceedingly careful in bringing up their fixed charges by establishing too high a basis of salaries for years to come.

Every business that is organized upon a healthy basis should have an adjustable system of compensation—a profit sharing or bonus arrangement by which employees share in the satisfactory returns of good years without getting the salary basis so high their houses would be seriously cramped or crippled by reason of such fixed charges in times of depression.

Bonus money cannot be counted upon, therefore is often saved and made the beginning of a bank account. But to put salaries on such a high basis that when bad years come it will be necessary to reduce them, is about the most demoralizing thing that could occur in any business.

Nashville.

GRAY & DUDLEY HARDWARE COMPANY.—This time of the year is ordinarily considered between seasons, as the fall trade is usually over and it is too early for the spring trade; but we see but little difference in the volume of business between this and the preceding fall months, and a great improvement over the same period of last year. In fact, the Hardware jobbers are very busy. A great many holiday goods are going out, and there seems to be a good demand for the general line of Hardware.

Jobbers and manufacturers do not seem so anxious to take orders for future business, as they usually do at this season of the year, rather preferring to wait and see what the market is going to do, as the great advances made in raw material causes the manufacturer to hesitate about making prices for the future, and this necessarily checks the sale of goods by jobbers and retailers for future delivery. While we have had a good many storms and some severe weather, taking it altogether we have had a pretty nice open fall, and notwithstanding the scarcity of labor, we believe the cotton crop is being gathered as rapidly as in former years. The recent advance in the price of cotton has had a good effect upon both trade and collections. Conditions generally are quite satisfactory.

The tragic death of Samuel Spencer has cast a gloom over the South, which was his field of operation, he having been a very great factor in the development of this section.

Philadelphia.

SUPPLEE HARDWARE COMPANY.—The Thanksgiving Day just passed apprises us of the near approach of the closing scenes of the year—stock taking and the holiday season, with the interchange of greetings and gifts, and the many other time honored observances, which lose nothing from their antiquity, but are interesting and enjoyable to old and young alike.

The Hardware community does not have to search long after causes for thankfulness, and if any one should be tempted to modify his enthusiasm with a recital of the difficulties of obtaining goods, the congested condition of the transportation companies, the high cost of living and the consequent necessity for an increased expense account, he should reflect that he is only emphasizing the abundant prosperity of the nation which causes the things he complains about. It is hard, therefore, to get up an argument with any one about present conditions.

The only unanswerable problem is, "How long will this prosperity last?" Older merchants, recalling the various seasons of stress and storm through which they have passed, and the ascending and descending grades between the brief periods of prosperity that they have enjoyed, find it hard to realize that our advancing civilization has modified the chances of disaster for commercial enterprises in somewhat the same ratio that the development and settling up of the country has removed the hazard of danger and death to the individual. Indeed, the marked difference between the savage and the citizen is their attitude in the open. The savage, trained by years of constant alertness, glides noiselessly along, ever expecting attack and always ready to repel it. The citizen strolls through life unarmed and unprepared, conscious of the protection which civilization has surrounded him with.

So our industries, formerly so aggressively competitive and aloof from each other in their preparations for attack or defense, were unprepared for scientific or economical management, and the sure result of a brief spell of prosperity was overproduction until the pile grew topheavy enough to fall over and carry general ruin to the industrial world.

Present conditions, therefore, seem more stable because more logical. There can be no good reason adduced why this country should not be prosperous and continue to be so. Any study of our resources must make one optimistic on this point, and while there may be many arguments against the bad trust, there can be no question but that the result of the combination of industries has tended to steady the market and, by controlling production, has avoided the conditions that formerly produced panic and the recurrent hard times.

Local trade continues in such volume as to seriously tax the ability of the jobbers to handle it. The season thus far has been open and favorable to building operations. Merchants are buying for the holiday trade in variety and quantity such as we have never seen equaled before. Collections are fair and will probably improve as December and January disbursements get into circulation.

Cleveland.

THE W. BINGHAM COMPANY.—We are thankful for the many blessings that are being showered upon us. Our barns are filled with plenty, our banks are bursting with money, and peace and plenty are prevalent in all our borders. Good trade in all lines of Mining, Milling, Manufacturers' Goods, House Trimmings, House Furnishings and the general line of Hardware for immediate shipment is strictly in evidence.

More goods than ever before at this time of the year are booked for future shipment. Many orders for Shovels, Spades, Scoops, Lawn Mowers, Hoes, Forks, Garden Rakes, Ice Cream Freezers, Refrigerators, Scythes, Snaths, Stove Pipe, Elbows and Refined Bessemer Sheets, Lawn Hose and Accessories, Screen Wire Cloth, Poultry Netting and Staples, Screen Door Hinges, Standard Wire Nails, Fence Wire and many other goods for early shipment, have been entered and are still coming to us in a large volume.

The prices on many lines of Hardware are so low (if the present cost of material and labor is considered) that we are looking for an advance before the time for the use of many articles arrives. "A word to the wise is sufficient." Buy and take into your stock early what may be called short season goods, such as are named above, and have them marked and nicely displayed in your salesrooms, so that when your customers call for them you will be prepared to serve them. Goods that are properly displayed are half sold. Screws, Files, Hammers, Axes, Hatchets, Picks, Mattocks, Butts, Carriage and Machine Bolts, Strap and Tee Hinges, House Trimmings, and all kinds of Mechanics' Tools can be bought now at low prices. All kinds of Pocket and Table Cutlery, Scissors, Shears, and Razors are cheap at the present prices. Sort up your stocks liberally and you will be the gainer thereby.

The demand for and consumption of general Hardware, Merchant Pipe, Malleable, Cast and Brass Fittings is immense and everything portends to scarcity and higher prices in the near future.

We trust that all of our customers' turkeys were large and fat and stuffed with good things on Thanksgiving Day. We promise to do all we can by good service to help continue the present prosperous and happy times that we are now enjoying.

Omaha.

LEE-GLASS-ANDREESEN HARDWARE COMPANY.—November closes with trade conditions in the Trans-Missouri region extremely favorable and fully as satisfactory as outlined in our previous reviews. There is a constant

and heavy demand for all kinds of seasonable goods, both from the agricultural and mining districts, and jobbers and manufacturers are well satisfied with the current volume of business.

The weather continues exceptionally fine and pleasant so that outdoor operations are being pushed forward vigorously. The strength of the iron market and the heavy pressure of business upon the mills and furnaces for months to come are features of marked importance. The prevalence of satisfactory and promising conditions may be considered as an assurance of continued prosperity. Heavy and staple goods are naturally responding to the impulse of the situation and rising gradually to a higher level of values.

The outlook for future business is very promising and the heavy movement of goods will probably extend through the winter months.

Louisville.

BELKNAP HARDWARE & MFG. COMPANY.—November as it closes carries with it a most handsome record of sales of Hardware and merchandise generally. There is no let-up to the great demand. Various apprehensions are expressed as to what will mark the climax to the present era of prosperity. Suggestions are timidly made that the railroads retrench in order to find out just where they stand; that municipal extravagance and national extravagance will tell adversely on results before long is believed by some, but those who are getting the most fun out of it certainly are those who believe the old Latin proverb "dum vivimus vivemus."

As to the money market which has now ruled high for several months, some insist that it is destined to continue at as full rates or nearly so until next summer; others think we shall see an easing up in January. It seems a gamble at best. We can be sure of this much—that those who have money to lend at present are reaping a very handsome reward for their thrift.

The great corporations and trusts have done the country signal service in holding down prices, which otherwise would probably have run away with themselves and the market. And yet these very gentlemen who believe in this policy as to mine and mill product, take the ground that unregulated rates of interest are most healthy in their effect: namely, in that they check overspeculation.

A few decades back, with the amount of business of to-day, there would have been a great many new stores and mercantile enterprises begun. The opportunity and policy of those already engaged in any particular line at the present date apparently is to expand their facilities and so keep pace with the increased demand; in other words, the distributors both wholesale and retail have only to take advantage of good times by improved organization, and the demands of the great army of buyers will probably be met satisfactorily.

This is not true, however, of mining schemes of which there are untold numbers at present. There are too many new trust companies and banks the outgrowth of the accumulation of capital in the hands of the people who have hitherto been unaccustomed to have much to invest, and who picture an "easy come" income through the banking channel. The temptation to such is to lend money on farms and fixed property which cannot be readily realized on when the pinch comes.

Portland, Oregon.

FAILING, HAINES & MCCALMAN.—It is almost late enough in the year to begin looking back at the business of the year just closing. We think we can safely say that we have never had a better year and that everything bids fair to be even better next year. Among the things that lead us to this conclusion are the following: Portland now stands at the head of the lumber ports of the world both in foreign shipments and in gross production. It also ranks second only to New York in the value of cereal exports, being a few thousand bushels behind. In custom house business Portland has this year led the combined exports of all the Puget Sound cities, and in imports it is second by a few hundred pounds only. In percentage of building permits for the year Portland leads every city in the United States, and does this without any apparent boom or inflation of values. During the last year Portland became one of the first-class post offices of the Pacific States, San Francisco and Los Angeles being the only others on the coast.

As we said in the earlier part of this letter the prospects for the next year are as good, if not better, than the closing year, and an unprecedented era of prosperity is here which bids fair to continue on the opening up of the new country, full of resources which are yet hardly touched.

Reports from all Hardware houses in this territory, and also in the Puget Sound and Spokane territory, are all to the effect that they have had a wonderful year and expect one still more prosperous. We are not worrying about getting trade, if we can only get the goods.

Baltimore.

CARLIN & FULTON.—The present month will end what has no doubt been in the experience of nearly every one a year of unusual activity, but for the next few days the sales will be confined generally to filling in orders for prompt shipment and principally for goods adapted to the holiday season. Many houses will take their annual inventory very soon, and the salesmen will be at home to spend Christmas with their families.

The year will end with a strong market and higher prices on a great many items, but not in comparison with what are understood to be market values for raw material. A comparison of prices taken from your issue of November 29 shows an advance in pig iron over the quotations of November, 1905, of 33 1-3 to 50 per cent. Bessemer billets at Pittsburgh show an advance of over 40 per cent., but we do not know of any manufactured Hardware as yet that has advanced proportionately.

Labor is in great demand, and by voluntarily diminishing the hours per day and the days per week the result is a diminished product and a demand in excess of the supply. It is the testimony of many manufacturers that higher wages mean a smaller production as the result of less necessity for long hours and steady employment. A combination of higher cost of raw material, higher prices for labor, difficulty in transportation, and the extraordinary demand is being reflected in the higher prices which are daily announced for manufactured products. The ability for still further advancing costs and maintaining them will depend upon the purchasing ability of the consumer.

At the present time money is abundant in the manufacturing and mining districts where labor is well employed, and its products are bringing large returns. The agricultural sections have also, with but few exceptions, had satisfactory harvests, so until the basic conditions change we see no reason to expect lower prices or less business, but rather the reverse.

NOTES ON PRICES.

Wire Nails.—Announcement was made on December 4 of an advance of $2.00 per ton in the base prices of Wire Nails and Wire products by the American Steel & Wire Company. While the fact has been recognized that general conditions have justified higher prices, since the advance of November 10, including the high price of Steel and the continued demand, the trade did not anticipate that another advance would be made so soon, or that prices would be jumped 10 cents per 100 lb. Demand has kept the company's warehouses well cleared of Nails, so that any accumulation of stock from this time forward will be to supply requirements for spring deliveries. Quotations are as follows, f.o.b. Pittsburgh, plus actual freight to point of delivery, 60 days, or 2 per cent. discount for cash in 10 days:

Carloads, to jobbers	$2.00
Carload lots, to retail merchants	2.05

New York.—The advance in mill prices of 10 cents per keg announced by the American Steel & Wire Company on December 4 has resulted in a corresponding advance by the local jobbers. Demand continues somewhat larger

than usual for the season, owing to the favorable weather for outdoor work. New York quotations are now on the following basis: To retailers, carloads on dock, $2.19; less than carloads, on dock, $2.33; small lots at store, $2.30.

Chicago.—New tonnage taken on during November compared favorably with the record breaking total of the previous month, and the open weather which prevails throughout the West and Northwest is favorable to a continued heavy consumption. Mill shipments are improving, however, and the shortage of some of the more popular sizes has to a large extent been relieved. A decline in consumption is expected toward the end of this month, and buying will not again be resumed until the distributers begin to prepare for the spring trade.

Pittsburgh.—The continued favorable weather for building operations conduces to a heavy consumption of Wire Nails and new demand continues quite active, in spite of the fact that the large trade bought heavily some time ago, or before the advance in prices. Shipments by the mills continue heavy and they are not able to accumulate stocks, Nails moving out as fast as the mills make them. The market is strong.

Cut Nails.—It had been understood by the members of the Cut Nail Association that any advance in the price of Wire Nails, previous to the next meeting, should automatically increase the price of Cut Nails a like amount. On this basis the price to jobbers for carload lots, f.o.b. Pittsburgh, becomes $2.05. Demand continues good, while on certain sizes the mills are still behind their orders, so that jobbers' stocks are poorly assorted. Advanced quotations are as follows, f.o.b. Pittsburgh: Carload lots, to jobbers, $2.05; less than carloads, to jobbers, $2.10; less than carloads, to retailers, $2.20. Iron Cut Nails at points west of Buffalo and Pittsburgh are held at 10 cents advance on Steel Cut Nails.

New York.—Cut Nails are still scarce in the local market and some sizes especially hard to obtain, so that the urgent demand for these makes requirements appear unusually large. Following the advance of 10 cents per keg at mill, New York quotations for small lots at store are now on the basis of $2.30.

Chicago.—Stocks in the hands of the local jobbers are badly broken, and delayed mill shipments are not favorable to replenishments. Demand is unusually heavy, the season considered, building operations being carried on without interruption. Prices are firm.

Pittsburgh.—New business in Cut Nails is fairly heavy, and on certain sizes the mills are considerably behind in deliveries. Stocks held by the mills and jobbers are very light and consumers find trouble in having their orders filled promptly.

Barb Wire.—The advance in price of $2 per ton, announced by the American Steel & Wire Company on December 4, also applies to Barb Wire. Demand is comparatively light, as is usually the case at this season. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Gal.
Jobbers, carload lots	$2.15	$2.45
Retailers, carload lots	2.20	2.50
Retailers, less than carload lots	2.30	2.60

Chicago.—There has been practically no change in the character of the demand, and the mills do not anticipate heavy buying until after the first of the year, when orders will be placed for the spring trade. Jobbers report a fairly heavy movement, which has been stimulated by the open weather. Quotations are firmly maintained.

Pittsburgh.—Demand continues light owing to lateness in season, but a material improvement in new business is expected early in the new year. Official prices are decidedly firm.

Smooth Fence Wire.—The advance of $2 per ton, made in the price of Wire and Wire products by the American Steel & Wire Company on December 4, included Smooth Fence Wire. Demand from Fence manufacturers is exceptionally heavy, and specifications are being received by the mills in large volume. Shipments are generally about 30 days behind, but even this is an improvement on former conditions. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads	$1.85
Retailers, carloads	1.90

The foregoing prices are for base numbers, 6 to 9. The other numbers of Plain and Galvanized Wire take the usual advances, as follows:

	6 to 9	10	11	12&12½	13	14	15	16
Annealed	Base.	$0.05	.10	.15	.25	.35	.45	.55
Galvanized	$0.30	.35	.40	.45	.55	.65	1.05	1.15

Chicago.—Shipments of Wire for the manufacturing trade have improved to some extent and deliveries of most gauges and grades can be made in 30 days. The requirements of Field Fence manufacturers are heavier than ever before at this season, the demand for their product breaking all records.

Pittsburgh.—Demand from Wire Fence manufacturers is unusually heavy, and specifications on contracts are being received by the mills in large volume. The shortage in cars and in supply of Steel is still interfering with shipments and output.

Wagon Hardware.—The line of goods usually grouped under the head of Carriage or Wagon Hardware has recently been advanced by a number of important manufacturers, the change approximating 10 per cent. Clevises, Welded Clips, Ferrules and Rings, Pole Caps, Fifth Wheels, etc., are among the goods included in this class.

Anvils.—A 5 per cent. advance has been made by important producers of cast Anvils.

Jack Screws.—Manufacturers of cast Jack Screws have raised their prices about 5 per cent. In this change and that referred to in the previous paragraph may be found a reflection of the market for raw material usually observed in goods of this character.

Merchant Pipe.—The market for Merchant Pipe is characterized by the strength naturally resulting from the heavy demand, the continued scarcity of material, and the steady advance in its price. Quotations on Pipe have moved up another point, and it is said that sellers are showing no disposition to bid for business.

Scale Beams.—Prices on steel and iron Scale Beams have moved up within the last few days, similarity being shown by the quotations of most of the leading producers of this line. The change amounts to 10 per cent. or more, but will probably not be immediately in full force in jobbers' prices. On the basis of the advanced cost the price to retail merchants may be represented in a general way by discount of 40 per cent.

Screws.—Much interest has recently been shown in trade circles in the market for Screws, both brass and iron, and some surprise has been expressed that the associated manufacturers have not advanced these goods in sympathy with other staple lines. Such action was expected by many well informed persons before the last two monthly conferences of leading producers. It has been the general opinion that on Brass Screws particularly an advance is not unlikely, as a result of the soaring of prices for raw material. On the other hand, it may be noted that all lines of Screws have been sold on a fairly remunerative basis since the establishment of the present list, and on Brass Screws an advance of some proportions occurred prior to the recent advance in raw material.

Tacks.—Firmness in prices on Tacks, referred to in recent issues of *The Iron Age*, continues as the characteristic feature of the market. Manufacturers are believed to be working more harmoniously than usual; as a result this frequently irregular market displays noteworthy steadiness. Quotations show an upward tendency and American Carpet and Cut Tacks may in a general way be quoted at a discount of 90 and 35 per cent., instead of 90 and 37½ as before. A similar advance is noticeable in other goods in this line.

Conductor Pipe.—The annual meeting of the associated manufacturers of Conductor Pipe and Eaves Trough is being held in this city during the present week. Matters of importance to producers and to the trade are understood to be coming up for discussion, in addition to the usual consideration of prices. It is generally be-

lieved, however, that there will be no important change in the arrangement under which the manufacturers are working together.

Asbestos Goods.—The principal feature of the market for Asbestos materials and finished products is the firmer tone, no actual formal advance in price being made, but manufacturers in the handling of new business will book it only on their own terms. While executing orders under contract at agreed prices, which for some months past have been more or less under schedule rates, there is unwillingness to book new orders at former quotations, depending on the amount of business already contracted for. It is generally stated that there is a marked advance in the raw Asbestos fiber to the manufacturer, in some instances said to reach 50 per cent. Contracts for this material are usually made for long intervals, varying in length for from one to several years.

Rope.—The market continues fairly firm under a slightly reduced demand for immediate shipment. There are reports of some carload orders having been placed for spring delivery, and manufacturers are anticipating a good volume of business during next year. New York quotations are as follows: Pure Manila, 12½ to 13 cents; B quality, 11½ to 12 cents; Pure Sisal, 9¼ cents; No. 2 quality, 8 cents; No. 1 Jute, ¼ in. and up, 8¼ to 8½ cents; No. 2 Jute, 7¾ to 8 cents per pound.

Window Glass.—The National Brokerage Company is reported as being located in the Machinery Building, Fourth avenue, Pittsburgh, Pa., and as receiving many inquiries, and taking some orders for Window Glass, at 90 and 5 for single, and 90 and 10 per cent. discount for double strength Glass, from the manufacturers' list. Jobbers' quotations, from jobbers' list, October 1, 1903, are as follows: Greater New York, 90 and 10 per cent. discount for all sizes, single and double strength; outside of Greater New York, 90 and 5 for single and 90 and 10 per cent. discount for double strength Glass.

Linseed Oil.—A moderate demand for Oil has characterized the market, which is a waiting one, because of the near approach of the close of interior navigation. Eastern crushers will then probably stop buying seed, as the all-rail freight rates will increase the price delivered. Western crushers, however, will be able to continue their purchases. What effect these conditions will have on the price of Oil will be watched with interest. New York quotations are as follows, according to quantity: City Raw, 42 to 43 cents per gallon; out of town Raw, 41 to 42 cents per gallon. Boiled Oil is 1 cent per gallon over Raw.

Spirits Turpentine.—The local market is quiet, demand being for immediate requirements only. Prices have declined about ½ cent per gallon during the week under review. New York quotations are as follows, according to quantity: Oil Barrels, 69 to 69½ cents; Machine Made Barrels, 69½ to 70 cents per gallon.

THE SOUTH DAKOTA RETAIL HARDWARE ASSOCIATION.

THE officers of the South Dakota Retail Hardware Association have secured the large new auditorium at Aberdeen for their annual convention, which will be held on January 31, February 1 and 2. It has also been decided to rent floor space to manufacturers and jobbers for exhibition purposes. Those desiring to secure space are requested to write to Otto E. Mueller, Aberdeen, who is first vice-president of the association and who has been delegated to take charge of this feature of the convention. The association is also intending to issue a journal in connection with the meeting, advertising for which is solicited, E. D. Hawkins, president, Vermillion, having this matter in his care.

THE firm of M. Brown & Co., Wapakoneta, Ohio, has lately incorporated under the style of the M. Brown Company. The Bent Wood Churn, U. S. Washer, Ash Dash Churns, Oak and Elm Measures, &c., are manufactured.

REQUESTS FOR CATALOGUES, &c.

The trade is given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations &c., relating to general lines of goods.

REQUESTS for catalogues, price-lists, quotations, &c., have been received from the following houses, with whom manufacturers may desire to communicate:

FROM THE SUNNYSIDE COMPANY, Sunnyside, Wash., which has bought the Shelf and Heavy Hardware, Stove, Implement, Paint and Furniture business of Lee A. Johnson & Co., and has put up a new building, 75 x 125 ft., with modern fixtures throughout.

FROM H. A. HEPPNER & Co., Portland, Ore., manufacturers' agents selling by direct shipment or through their warehouse to jobbers and large consumers in Oregon, Washington and British Columbia, who desire catalogues from manufacturers of iron and steel finished products, Plumbers' Goods, Hardwood Lumber, Wagon Wood Stock, &c., with prices net to them or subject to commission.

FROM PRYOR & HILL, Harrisburg, Ore., who have succeeded to the Hardware, Stove, Paint, Implement and Saddlery business of Taylor & Pryor.

FROM THE CORBETT-TAYLOR COMPANY, Trenton, N. J., who will be pleased to receive quotations from manufacturers of lines handled by the company, including Belting, Pulleys, Shafting, Power Transmission Machinery, Machine Tools and Supplies, Trucks and Wheelbarrows, Valves, Pipe and Fittings, Steam and Water Specialties, &c.

FROM CHARLES AREY, Salisbury, N. C., who began the wholesale and retail Hardware business in June last. Mr. Arey makes a specialty of Cutlery, Edge Tools and novelties. He also handles Fishing Tackle, Gasoline Engines, Motor Cycles, Automobiles, &c.

FROM THE VIRGINIA IMPLEMENT & HARDWARE COMPANY, South Boston, Va. Until within the past six months this company has handled but little Hardware, but is now greatly increasing its lines in this department, and will be pleased to receive catalogues from manufacturers.

FROM THOMPSON & SON, who have purchased the business of Newland Bros., in Harrington, Wash., and who will carry a retail stock of Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Paints, Oils, Sporting and Athletic Goods.

THE GARRY IRON & STEEL COMPANY, Cleveland, Ohio, with Eastern office at 1123 Broadway, New York, in addition to its former products has for some time been making the Cleveland Expanded Metal Lath. This Lath is referred to as sufficiently stiff and rigid to preclude its bellying or buckling on the ceiling or wall, and yet is suitable for all kinds of work, plain or ornamental, straight surface or wrapping beams, columns, &c., and being self-furring, is especially adapted to exterior stucco work. Being the same on one side as on the other it is reversible and therefore cannot be improperly applied. Having a smooth selvage on each edge, it is easy to handle, as well as to staple or tie on. This company was reorganized about a year ago, and while Metal Lath is a new proposition for it, it is not new to some of the individuals who comprise its official list, namely, George D. Wick, president; W. A. Kingsley, treasurer, and Samuel Siddall, secretary, all of whom, by reason of their former experience, are familiar with this line of business.

THE EDWARDS-CHAMBERLAIN HARDWARE COMPANY, Kalamazoo, Mich., has increased its capital stock from $70,000 to $100,000, to meet the demands of its rapidly growing business. During the spring the company will erect a new building, providing about 80,000 ft. of floor space, which will be devoted entirely to its own business.

TRADE WINNING METHODS.

This department is for the description of approved methods of carrying on and extending business, and a cordial invitation is given to merchants to co-operate in the effort to make it suggestive and of practical use to the trade.

A CHRISTMAS WINDOW DISPLAY.

FOR a number of years the firm of John M. Page & Co., Naugatuck, Conn., has made it a point to have something in the way of a spectacular window display during the holiday season. Its experience as to business results has always been satisfactory and the labor and expense entailed in preparing the exhibits have been amply repaid. Perhaps the most attractive, certainly the most successful, so far as winning trade is concerned, was the Indian encampment display which is reproduced herewith. This evoked many flattering compliments from beholders, strangers to the firm, as well as regular and occasional customers.

The space occupied by the exhibit was 8 ft. wide by 6 ft. deep. The lake, or larger body of water shown, was back from the window front about 2 ft., the surface being above the level of the window. The water, obtained by connection with the town supply, was contained in a pan about 30 x 24 in. in dimensions, with outlet at dam about 4 in. wide. The dam and front side of lake were built up of broken stone, about the size of an egg, which produced a very natural effect. There was a drop of about 8 in. at the dam, where the water emptied into a tin trough about 4 in. wide and 2 in. deep, painted a dirt color on the inside, small stones having been placed in the trough bottom to produce ripples in the rapidly flowing water. The trough conveyed the water to the pond shown at the right, which was fashioned out of a good-sized Dish Pan, with outlet in the middle about ½ in. from the top, so that the Pan was nearly full of water. In this pond 50 or more small fish caught in a neighboring brook disported themselves, keeping constantly on the move and adding much animation to the display. The overshot wheel shown was made of wood and was about 10 in. in diameter. A dilapidated building representing a deserted sawmill stood near the lake.

Indian Encampment Window Display.

Beyond the lake was an Indian camp, with a pine forest as a back ground, made from limbs of pine trees. The camp had three wigwams, made of poles and white birch bark; a Camp Kettle hung on Crochet Sticks in front of the tents, with Indians scattered about the grounds. The Indians and horses were obtained from a toy store. On the lake were several canoes, made from white birch bark; also a few floating toy ducks. The ground was covered with fresh green moss gathered from the woods, with small ferns here and there, which with sprinkling occasionally kept fresh and growing for the two weeks the display remained in the window. From the Indian camp was a trail of white sand sprinkled on top of the moss, which wound down the hill and crossed the brook on a rustic bridge, made from small round limbs of trees.

F. H. WOODWORTH & Co., Chattanooga, Tenn., whose establishment is exceptionally attractive and well appointed, are sending out postals to their customers in which a view is presented of their retail department. This is an effective way of calling attention to any store the conduct and arrangement of which is creditable to the management.

OSCAR KVALSHAUG, Hardware merchant, Beresford, S. D., has issued an attractive catalogue devoted exclusively to Sewing Machines, of which he handles six distinct classes or lines. The Machines shown are fully illustrated and described. Each Sewing Machine is sold under a warranty for 10 years, a certificate to this effect being given. In a preface to the catalogue under the head of "A Word with You," Mr. Kvalshaug has something to say about the quality and claims of Machines sold by mail order houses. He also refers to the moderate prices he makes on the lines handled, and gives reasons why it will pay the farmer to deal with him.

A GOOD SALESMAN.

BY B. Y. N.

THERE is considerable emphasis now being placed upon salesmanship and what constitutes a good salesman. A wrong inference might be drawn from the latter part of a somewhat ancient statement to the effect that, "A fool can sell any one what he wants, but it takes a salesman to sell a person what he don't want." The indefinite part of the saying lies in the words, "what he don't want." I believe a customer is as much disgusted when he has been talked into buying the article not wanted, as something for which he has little or no use.

Short Sightedness.

In the retail clothing trade no evidence of conscience is visible. Misfits, unbecoming styles and colors, in fact any old thing, apparently just to make one sale, is forced upon customers. I have noticed in men's furnishing stores that after the goods asked for have been purchased, clerks invariably ask if the customer does not want socks, collars, underwear, &c., and after a more or less emphatic negative reply by the customer, as the occasion seems to demand, the clerk continues his parrot rigmarole, apparently without any assurance of interesting the customer in further purchases. These two instances show the negative side of salesmanship.

Study of Conditions.

Usually the best and highest priced goods will yield the largest percentage of profit and give the customer the best satisfaction. But, for instance, if a householder wants a Trowel to do a little plastering with, a 50-cent article might answer his purpose as well as one that cost him two or three times as much. The customer will usually appreciate the salesman's interest in him. If the customer is in a hurry to get at his work, he is likely to resent any importuning by the salesman to consider any other purchase at that time. Besides there is danger of destroying the good impression made upon the customer's mind by the suggestion of the cheaper tool.

Different Kinds of Customers.

Customers come more than half way when they enter a store as possible customers, and it usually lies in the salesman's power to encourage them to come again. There are customers who know what they want to buy; some who have postponed purchasing what they need, and some who do not know that the merchant handles what they need. There are, however, comparatively few, even among a merchant's regular customers, who know just

what the best article is for some specific use, as in the case of the Trowel. Others do not know of the improvements made in almost every line, but have a preconceived idea that they want the same kind or style of article they have been accustomed to. A man who is even an indifferent tinker about the house, asks for a Wood Plane because his father used one, and because he knows nothing of adjustable Iron Planes. This is a case where the best is the best for his use. No customer knows as much about most goods as the salesman should know, as to their intrinsic and money value.

Treatment of Customers.

Salesmen should be affable and attentive to customers and address people by name when possible. The man behind counter seldom appreciates what a leverage he has if he can associate names and faces correctly, and call a customer by name, especially one who only comes in occasionally. A nicely wrapped package, conveniently arranged for carrying, in each particular case, is a courtesy customers usually appreciate. Doing more for customers than they naturally expect (not cutting prices) creates friendships.

Power of Suggestion.

A necessary qualification of salesmanship is to be able to create a desire in the minds of customers, by suggestion, for what the salesman has to sell and which is suited to the requirements of individual customers. After a purchase has been made is the time to create a desire in the customer's mind for something he or she had not thought of buying. "Do you want anything else?" seldom results in additional business, and it is a question in my mind whether it is ever best to ask a person outright to "buy" anything, or to say, "I would like to sell you" so and so. Calling attention to some new article or improvement in some older style will usually interest customers, if it is something they need or are likely to want. Merit, not price, is a better argument than "dog cheap." Knowing how to approach different customers with a view to bringing about a desire in their minds to own the goods; to know just what to say and the arguments to be used in each particular case is a big study and a fine art when attained.

Familiarity With Goods.

This naturally brings up the subject of a thorough knowledge of goods, their adaptability to certain uses, their merits and superiority over other styles and kinds. A customer who has confidence in a store or the salesman will accept an opinion regarding the more desirable article. The salesman must know how to explain the construction, arrangement, use and economy of the article being considered and not hand the customer a descriptive circular to read and digest, as once did an inexperienced clerk with a heating Stove customer. When the prospective customer is in the store is the time to interest him or her in goods they did not expect to buy and to close the deal, if possible, and not let them leave with a circular, which they are likely to throw away when out of sight of the store door. Each sale should be followed by a distinct expression of thanks, accompanied by an invitation to call again.

Qualifications.

The person who has given close attention to this subject will arrange the qualifications of salesmanship somewhat in the following order: Affability, neatness, politeness, close attention, knack of holding more than one customer at a time, if necessary; tact and power of suggestion. A desirable division is to give three-quarters of time and energy to selling and the remaining quarter to other things. Selling would include unpacking, pricing and arrangement of goods, disposing of them to customers, advertising, window display, and solicitation of business outside the store.

Athens Hardware & Furniture Company, Athens, La., has just been organized to conduct the Shelf and Heavy Hardware, Stove, Implement and Sporting Goods business.

TRADE ITEMS.

THE HURLEY MACHINE COMPANY, Chicago, which was organized about six months ago, has met with much success in the introduction of its floor scraping machine throughout the United States, as well as in the leading foreign countries. In fact the export trade of this company has developed so rapidly that it has been deemed advisable to send a special representative abroad, and Geo. E. Spaulding, who sailed for Europe November 28, will be in charge of the floor scraper exhibit of this concern at the Paris Automobile Show, the management of the latter, in addition to providing space for automobile display, having set aside a section for modern and improved machinery. The offices of the Hurley Machine Company of France will be at 1 Rue de Laborde, Paris, with Geo. E. Spaulding as managing director.

THE GLEN MFG. COMPANY, Ellwood City, Pa., maker of Steel and Wire Specialties, including Ornamental Iron Work, Heavy Steel Fences, Stable Fixtures, Folding Steel Mats, Tree and Window Guards, is running its plant to full capacity and has a large amount of business on its books. It should be noted that the address of this company is Ellwood City, Pa., the impression being current to some extent that its location is in another State, owing to the fact that there are several cities of the same name in the United States.

THOMAS P. SWIFT, West Roxbury, Mass., founder of the New England Screw Company, Boston, died at New Bedford November 29, aged 52 years. He was born in Plymouth, Mass., and when a young man entered the employ of Loring & Parks, Tack manufacturers, and afterward engaged in the manufacture of Rolled Thread Screws in Boston. He organized the New England Screw Company in 1892 and was identified with its interests until six years ago. He was well known as a musician, and was for years a church organist. At West Roxbury he was prominent as a musical director, and had trained choral societies about Boston for some years.

T. C. PROUTY COMPANY, Albion, Mich., manufacturer of Parlor and Barn Door Hangers and Hardware Specialties, Boggs-Howland Company, 23 Warren street, New York, Eastern representative, is distributing among its friends in the trade a leather bound vest pocket memorandum book.

WALWORTH MFG. COMPANY, Boston, Mass., New York office Park Row Building, manufacturer of the Stillson Wrenches and other Tools, Brass and Iron Goods and Steam, Water and Gas Work, is sending out with its compliments a desk calendar pad for 1907, with metal frame, which may be used as easel or hanger. Interest is added to the calendar by notes on each leaf calling attention to important historical events which occurred on the specified days.

CLAYTON BROS., manufacturers of Scissors, Bristol, Conn., have sold their factory and business to W. M. Bowes and S. L. Butler, New York. Mr. Bowes has been the sole agent for Clayton Bros., at 127 Duane street, New York, and will continue to sell the product of the plant, which will be run under the same name as heretofore.

GEORGE H. BISHOP & Co., Lawrenceburg, Ind., will have ready for distribution on January 1 a new illustrated catalogue of 110 pages in which will be found more than 70 new Handy Saws and Saw Tools, mostly of their own design and covered by patents. On that date all former lists and discounts will be discontinued.

JOSEPH K. SCHMIDT, senior member of the firm of Schmidt & Sandoz, Verdigre, Neb., died on the 24th ult. Mr. Schmidt was one of the pioneer Hardware merchants of northeastern Nebraska. The style of the firm will remain unchanged for the present, Mr. Schmidt's interest being continued by the estate.

AVERY HARDWARE & SUPPLY COMPANY, Pensacola, Fla., has secured the services of W. A. Ray, who has been traveling for Teague & Sons, Montgomery, Ala., for the past seven years. Mr. Ray will have charge of Avery Company's jobbing department, the business of which it is expected to increase by putting several more men on the road.

DEATH OF FRED GOODRICH.

FRED GOODRICH, president and treasurer of the Taplin Mfg. Company, died at his home in New Britain, Conn., December 2, from a complication of diseases, in his sixty-third year. Mr. Goodrich had been connected with the Taplin Mfg. Company for about ten years, but previously had represented Landers, Frary & Clark on the road, visiting the company's best trade.

He was born at Collinsville, Conn., November 20, 1844, his father at that time being in the employ of Collins & Co., the well-known manufacturers. When but eight years old, both parents being dead, the boy was sent to work on the farm of an uncle at Granby, Conn. At 14 years of age he became a clerk in the then large dry goods store of George V. Warren & Co., Boston, Mass. Enlisting in the army at the breaking out of the Civil War, he served the entire period as a drummer boy until April, 1865, in the Twelfth United States Infantry. He obtained a position as clerk in the old New York post

FRED GOODRICH.

office, in 1865, under Postmaster John Kelly, but left it to accept a position as traveling salesman for a large granite company in Connecticut. In February, 1873, he went to New Britain, Conn., to live and in that month made his first contract with Landers, Frary & Clark, with whom he was closely connected for over 20 years.

Mr. Goodrich was thoroughly appreciated and respected by business friends and acquaintances, with whom he was deservedly popular. He was genial in disposition and trustworthy in character, a man of his word and an excellent salesman. He belonged to the Masonic order and was president of the Board of Trustees of the Methodist Church in New Britain. He is survived by a widow, two sons and a daughter, one of the sons being a prominent Brooklyn physician and the other a magazine editor. The business will be carried on without interruption, Mr. Goodrich having been unable to give much attention to it on account of poor health for nearly two years.

THE Boston branch of the H. W. Johns-Manville Company will move early in December into a new building at 55, 57 and 59 High street, Boston. This entire building, which comprises seven floors, will be occupied by the offices, sales and shipping rooms of the company, and will provide every facility for doing business comfortably, conveniently and promptly. The increase of space provided will enable the company to carry a much larger stock than ever before, and thus meet the steadily increasing demand in the city and vicinity of Boston and the New England States for its various products.

DEATH OF HENRY H. CLARK.

HENRY HERMAN CLARK died on December 4, 1906, at his home in Milldale, Conn., after a week's illness, at the age of 77. Mr. Clark was senior member and president of the Clark Bros. Bolt Company of Milldale and was one of the oldest living Bolt makers, having been active in promotion and management of the Bolt industry in Milldale since 1853. Also he was president of the Ætna Nut Company of Southington, Conn.

He is survived by his older brother, ex-Senator Wm. J. Clark of Stony Creek, Conn., and a younger brother, Hon. Chas. H. Clark of Milldale, Conn. The three brothers were closely allied with the origin of the Bolt industry in the country. Mr. Clark leaves a son, Chas. W. Clark, who is connected with the Clark Bros. Bolt Company, and the business will be continued as heretofore.

Mr. Clark's record in public and personal affairs was that of an honorable and conscientious man, whose upright life and charitable spirit won for him the esteem of all those with whom he came in contact. He was justly numbered among the leading and useful citizens of his town.

STANDARD HEAVY HARDWARE CATALOGUE.

THE illustrated catalogue of Standard Heavy Hardware, Iron and Steel, Wagon Wood Stock and allied lines, which has for some months been in preparation by the Catalogue Committee of the Western Heavy Hardware Jobbers, of which W. M. Thompson, Chicago, is chairman, has just been issued. It is a cloth bound book of 614 pages, each 8½ x 11 in. It illustrates and describes varied and large assortments of Blacksmiths' and Wagon Makers' Tools, Carriage and Wagon Hardware, Malleables, Carriage Trimmings, Paints, Oils and Varnishes and many lines of analogous goods, handled universally by dealers in Heavy Hardware. In many instances the makers of specified lines are named with addresses, while many staple and standard schedules apply equally well to most makers without distinction. It will be interesting to determine by actual experience of how much value such a composite production will be to the many interests contributing to its support and to what extent it will be feasible for producers to abandon individuality and adopt it as their catalogue.

NATIONAL AND NEW ENGLAND ASSOCIATIONS WILL MEET TOGETHER IN JUNE.

THE dates of the conventions of the National Retail Hardware Association and the New England Hardware Dealers' Association have been set for June 18 to 21, inclusive. The meetings will be at Boston, it having been determined at the last annual convention of the National Association to hold the next meeting in that city, and the New England association having decided to defer theirs so as to be held simultaneously with the National. The headquarters of both associations will be at the New American House, where ample facilities are available for the meetings and also for the exhibits of those who wish to show their products. Committees have in charge the matter of exhibits and a guide book to Boston, in addition to routine plans.

CHARLES J. CALEY has been made general manager of the Russell & Erwin Mfg. Company, New Britain, Conn., and will have entire charge of the manufacturing end of the business. Mr. Caley has been general superintendent of the works for more than five years, succeeding Mr. Williamson. The office of general manager has been created that the manufacturing may come more directly under Mr. Caley's control. A banquet was given in Mr. Caley's honor at the Hotel Garde, Hartford, Dec. 1, by the foremen and heads of departments of the Russell & Erwin works. Treasurer I. D. Russell was the toastmaster. It was announced during the evening that Joseph Schilling has been appointed general superintendent.

JOHN S. LENG'S SON & CO.

JOHN S. LENG'S SON & CO., 33 Murray street, New York, who deal largely in Bicycles and Bicycle and Automobile accessories, sundries, &c., have just been appointed special district agents for the Columbia Phonograph Company, in Connecticut, New York and New Jersey, their special function being to present to the Bicycle trade the advantages to them of combining the Phonograph business with the Bicycle business they are already engaged in. While Phonographs are sold and played at all seasons of the year they are particularly in demand during the long winter evenings and severe winter weather when the Bicycle business is necessarily at a standstill. The advantage of this arrangement to the firm's customers is considerable at all seasons of the year, in consequence of being able to combine their purchases in the Phonograph and Bicycle line with one house, thus saving in transportation and the going from one establishment to the other in making purchases. The progress in manufacturing Phonograph Records and Phonographs has been very great in the last two years. At the Columbia factory, for example, 10 large rooms are set apart for the experiments of specialists in Phonograph Instruments and musical matters, who are continually testing new ideas. The most recent addition to the Columbia staff is Marconi, the wireless telegraph expert, whose discoveries in the treatment of sound waves are of great value in the construction of Phonograph Instruments. John S. Leng's Son & Co.'s stock is entirely new and is daily kept up to complete assortments of stock records by careful watching and reordering, while their central location makes them especially easy of access to all parts of the metropolitan territory.

Inventory Method of a Southern House.

ABOUT this time last year we described the method adopted by the Asheville Hardware Company, Asheville, N. C., in taking the annual inventory. While this plan was found to serve its purpose very well, the company, ever on the alert to improve its business methods, has modified and supplemented the programme for taking this year's inventory. In view of the interest and importance of the changes and additions made we present the 1906 plan herewith. We also reproduce one of the inventory sheets filled out with fictitious entries.

Several weeks since the employees of the house were notified that the inventory would begin on Monday, December 3, and that on Friday evening, November 30, a meeting would be held for the purpose of discussing and making clear the arrangements for stock taking, typewritten copies of which were early given to each employee so as to make them familiar with the scope and details of the plan.

Following are what might be termed general instructions to the company's force: .

ASHEVILLE HARDWARE CO.

No. 68 ASHEVILLE, N. C. Salesman J. H. Case

Sold to

Town Co. State

Time Ship Ship to

Remarks Left side ware room Jan 10-'06

Register No.	List Price	Net Price				
208 Doz Blk Dia. Mt. A. Files 8" [illegible]	4.30		894	40		
187 " " " " " 10 "	5.60		1047	20		
36 " " " " " 12 "	7.50		270	00		
			2211	60		
75%					552	90
153 Ashcroft Chipper Pkt Knives #1171545 "		1.70	260	10		
77 " " " " " 26651 "		1.70	130	90		
43 " " " " " 17 Cut "		3.35	144	05	535	05
18 " Cattle Leaders #52	2.30		41	40		
60-10-20-10					10	73
30 Sets Pad Locks #11 on Card [illegible]		.62	18	60		
23 " " 22 " "		.75	17	25		
18 " " 33 " "		1.07	19	26		
17 " " 44 " "		1.60	27	20	82	31
Amount Forward					1180	99

Specimen Inventory Sheet of Asheville Hardware Company.

General Instructions.

The men in the store will commence work in the following places:

THIRD TRAVELING SALESMAN: Back warehouse up and down stairs, back cellar and front cellar.

FIRST TRAVELING SALESMAN: Wareroom—*i. e.*, first floor, back of pillars.

SECOND TRAVELING SALESMAN: Second story wareroom.

THIRD STORE SALESMAN AND BUYER: Front of store, with the understanding that they must respond quickly to request from First and Second Store Salesmen for attention to trade. Any definite assignments as to work on inventory the general manager will have to make based on the situation for any one day.

Dividing the men in this way we hope that we can bring the inventory up to pillars within a reasonable length of time, and then all hands can work in the front part of store.

Shipping clerk will report to general manager for any directions in regard to inventory which he does.

In handling any overflow of customers First Salesman and Second Salesman call on Third Salesman and Buyer, and will ring the office bell in preference to back bell for salesmen in rear.

We do not wish any work done on inventory between 12 and 2.30, except by traveling salesmen.

In working in warehouse and warerooms First, Second and Third Traveling Salesmen will employ any laborers whom they can use to distinct advantage. We think it most important that the part we have allotted to them shall be done carefully and promptly, and do not believe a little added expense in the employ of labor will be anything but economical in the end.

First Salesman will provide a book in front of the store marked "List of Goods Which Have Been Taken." Under this head at the end of each night indicate the goods which have been taken. For instance, if First Traveling Salesman had the day before taken, or the night before taken, an inventory of Hames, simply write "Hames" down on this list. When it is necessary to make exceptions to such a list they should properly note and then afterward erase. For instance, if he has taken all of the Hames except those in some particular location or kind of goods, he would indicate "Hames, except ——." When this inventory is complete simply erase the exceptions.

We will have a place in the store marked, "These Goods Are Not to Be Taken in Stock." Receiving clerk will refer to either general manager or bookkeeper all

invoices coming in from commencing of inventory, getting definite instructions on each.

We do not like to ask night work as a rule, but during inventory we will ask you to come back and work as much as you can without injury to your health.

We want you to think as you go and see where these suggestions in regard to inventory are good, and as you work in either stock or writing down have matters clear whether they are touched upon in these suggestions or not.

The typewritten circular issued to the employees then goes into the details of taking the inventory as follows:

Writing Up Sheets and Sales Record.

1. Sheets which we will use are the ordinary blanks used for writing up orders. It is entirely proper to write on both sides, and better from the fact that the bulk of book when bound finally will be smaller. Please be careful that the two holes on the left hand side of the page are not torn, as the sheets will be bound using these holes.

2. Do not write upon the two top lines of any sheet.

3. Do not write upon the two bottom lines of any sheet.

4. At the head of the sheet indicate in what part of the store the goods are. The divisions will fall very naturally and we think might be as follows:

a. Show cases.
b. Top ledges, right hand store.
c. Top shelves, right hand store.
d. Bottom shelves or drawers, right hand store.
e. Counters, right hand store.
f. Top ledges, left hand store.
g. Top shelves, left hand store.
h. Bottom shelves or drawers, left hand store.
i. Samples in center of store.
j. Goods under counters, center of store.
k. Right hand side wareroom.
l. Left hand side wareroom.
m. Middle space wareroom, including goods hanging up.
n. Third floor.
o. Front cellar.
p. Back cellar.

5. Be sure that the space of one line is left between items of different kinds. This applies also to different items of the same kind of goods. For instance, there should be a line left between Flat Head Bright Screws and Flat Head Brass Screws, or other goods. Also, for instance, No. 7 Hand Saws and D8 Band Saws would take a different discount and a line should be left between them.

Naturally and to make matters clear you would skip a line between goods which were invoiced at per dozen, and others immediately following, per each, per C, per M, &c.

6. Immediately to the left of list or net prices write opposite each item the abbreviation:

Doz.	where	items	are	per	dozen.
Lb.	"	"	"	"	pound.
Cwt.	"	"	"	"	hundred weight.
C.	"	"	"	"	hundred.
M.	"	"	"	"	thousand.
Ea.	"	"	"	"	each.
Set	"	"	"	"	set.
Keg	"	"	"	"	keg.
Gro.	"	"	"	"	gross.
Pr.	"	"	"	"	pair.

Full where price is for lot.

7. Be careful to put net prices in net price column, list prices in list column. Do not use cost mark, but write your cost out, either list or net in plain figures.

The above is important also where you are naming cost on sales. But on sales use cost mark.

8. Use consecutive numbers on all sheets written. For instance, Mr. Morris should head his sheets "Morris, 1, 2, 3, 4," &c.; Mr. Wells, "Wells, 1, 2, 3, 4," &c.

9. Be careful that all goods of a certain kind fall under each other. For instance if No. 11 Chest Handles were in one row of shelves, and No. 12 in another, the goods should be rearranged so that all Chest Handles are thrown together, and the inventory of Chest Handles all be in sequence. This is very important for the proper arrangement of inventory, and we ask you to be careful about it.

10. The only exception to the above is in Builders' Hardware. Second Salesman has a special arrangement for this line of goods, and it should be taken according to his arrangement. This he will attend to.

11. Each evening we wish those working on inventory to stop at 5 o'clock, and get all the sheets they have taken during the day priced.

12. On December 3 post cost on all sales. Also on cash book in front of store place your initial letter in the column and the letter N on the left if the item sold has not been taken, and T if it has been taken; likewise on each item of any ticket sale or any sale entered on shipping sheets. If neither N or T appears it will be necessary for the person keeping the inventory to look up the person making the sale and have him find out whether or not the goods have been taken, thus taking a great deal of extra time, so we trust that you will invariably note this and save time and trouble. This will be in effect throughout inventory.

13. After the stock of any item is taken write a tag so stating and attach to goods.

Improving Condition of Stock.

14. We wish each man to have a separate want book, which we will furnish you, and which you will find divided as follows:

a. WANTS. Under this head make a notation of all short items for which orders should be placed. At the end of each evening transfer from this want book such items *only* as should be ordered immediately, in such case marking out or checking off on your book item added on general want book.

b. GOODS WHICH SHOULD HAVE SAMPLE BOARDS OR SOME BETTER DISPLAY DEVISED. Under this division simply make a memorandum, and after inventory is entirely taken and completed, and at our convenience later we will properly provide some display.

c. GOODS WHICH ARE BAD STOCK OR ODDS AND ENDS. Simply make a notation of this and we will afterward go over.

d. GOODS WHICH SHOULD BE MARKED OR ADDITIONAL LISTS MADE OR PRICES CORRECTED. Under this head simply make a notation of where you think prices should be corrected, or where goods are not marked and should be marked, or where other lists besides the one in the book in front should be put near the stock.

The suggestions which are got up in this want book we do not wish brought up until after the inventory is complete, unless there is some important matter which should claim our immediate attention. It is simply an arrangement for afterward getting our stock and facilities for prompt and accurate sales in better condition.

15. Leave all stock in absolutely clean condition, taking out the goods from where they are stored and sprinkling and sweeping underneath. Let us have a nice, clean store, as far as the corners and out of the way places are concerned, after our inventory is done.

16. All shelves should have all the goods taken out and the bin in which they have been brushed out. It is a very good plan to have with you a box of damp saw dust for sprinkling in shelves, and then dusting same out, or a damp cloth to wipe same out. This will avoid dust floating around the store and will add a good deal to your comfort in cleaning.

17. When two or more boxes have been opened one of the boxes should be filled. For instance, if one of the boxes of Padlocks has seven in it, and another one eight, make one of the boxes a full dozen, leaving one with the remaining three in it. Do not carry this matter too far and throw away boxes which might be used. It is not a bad plan to have an empty box with the proper number on it along with stock for use where some one buys less than a package.

18. Be careful in going over stock to see where you think it advisable to oil certain goods. For instance, Cross Cut Saws, Circular Saws and other things which you know will be liable to suffer from rust, should receive, as you go over the inventory, a slight coating of oil.

19. On the morning of December 30, we want the following stock taken, regardless of attention to other matters of inventory. That is, we want you to arrange among yourselves to take these items, leaving off your work in other items:

a. Nails, both kegs downstairs and broken lots in bins.
b. Horseshoes, both full kegs downstairs and broken lots in bins.
c. Loaded Shells, Cartridges, both in full cases and broken lines in shelves.
d. Shot, both in cases in front and bags in rear.
e. Powder, both in canteens in front and in magazine at side of store.
f. Powder in magazine in country.

Of course, if we finish prior to December 30, we will take above on last day.

Second Salesman will on this date take the stock of Machine Needles, and in doing so will estimate those in bins.

Care of Customers.

20. During the entire inventory we want Mr. Hollingsworth and Mr. Long in charge of the front of the store. We do not want anything to interfere with their proper charge of customers, unless it is to give some verbal information to parties requiring it in regard to inventory. Of course, these two gentlemen may find some little snatch work which they can do without detriment to trade and we have no objection, but the responsibility of waiting on the trade or having it waited on rests entirely on these two.

Proper Pricing of Sheets.

21. Posting clerk must inspect prices before assistant bookkeeper extends.

Where any difference exists between prices made on inventory sheets and general manager's price book, report to him for correct adjustment.

22. Assistant bookkeeper must keep record of sales up each day.

FACTORY COST AND BUSINESS METHODS.

THE COST SYSTEM OF A NEW ENGLAND COMPANY.

THE D. E. WHITON MACHINE COMPANY, New London, Conn., manufacturer of Chucks and Machinery, has in operation a very efficient system of keeping track of machine and labor cost in connection with the payroll, which has been evolved in meeting the needs of the company's business and which is equally applicable in other lines of manufacture where the product is considerably diversified. An examination of the cards employed and the page from the daily cost report book, which are reproduced herewith, will indicate how simple the system is, although it is at the same time complete in that the payroll is carefully checked, and each man's work is tabulated according to its lot number and operation, so that the exact labor cost of each operation and each piece and each completed Machine or Chuck is known when a lot is finished.

Workmen Have Cards for Every Job.

Each day every workman (or his department foreman) makes out the card shown in Fig. 1 for each job that he performs, a job consisting of a simple operation on any number of similar pieces. He may have several jobs in one day or one job may consume several days. In any case he makes out at least one such card a day, and if he has more than one job to perform he makes out as many cards as there are jobs. This card, it will be

LOT NO. 101 — CLASS OF WORK — NAME 34
PIECES IN LOT 50 — 12" 2 jaw chuck Body — RATE PER HOUR .20
Operation (No. 1) — Hours 4
Special — Hours
Remarks — $ .80
Total Cards this date — Card No. — Total hours this date
Pieces finished this date 7 — Date Dec 3, 1905
Product of Machine No. 2
DAILY SERVICE TIME CARD THE D. E. W. M. CO. (MAKE SEPARATE CARD FOR EACH OPERATION)

Fig. 1.—Workman's Job Card, Known as Daily Service Time Card.

noted, contains the lot number of the work performed and the number of pieces in the lot; the class of work, the number of the employee and his wage per hour, the operation that he performs or what the special job is, if it is not in the regular line of production; the hours consumed on the operation and the wage equivalent in dollars and cents, and the date and the machine number. The "total cards this date," the "card number" and the "total hours this date" are no longer filled out, being unessential under the present working of the system.

Each Day's Cards Collected in Envelope.

At the end of each day the employee puts the cards representing his day's work into an envelope, the front of which is shown in Fig. 2. It contains blanks for his name and number, total hours worked, rate of wages and the amount for the day in dollars and cents, and the record of the time recording machine. The workman fills out the blank, excepting the time clock record. In the employees' entryway is a line of boxes, like letter boxes, lettered to correspond with the shop departments of the works, which are known as department A, department B, &c., up to department T. When passing out at night each workman drops his envelope into his department box. They are thus collected by the time clerk according to shop departments. This clerk examines the cards contained, foots up the hours worked, compares the total with the man's record on the time recorder, fills out the envelope face with this record, and if it tallies with the man's own statement of hours worked the envelope itself is ready to go to the office for the making up of the payroll. If there is a discrepancy between the time recorder and the workman's own statement of his

NAME John Jones No. 34
DEP'T. 4 DATE Dec 3, 1905
HOURS 10 RATE 20 AM'T, $ 2.00
(EMPLOYES WILL FILL IN ONLY NAME, No., DATE, AND HOURS WORKED.)
TIME CLOCK RECORD.
A. M. IN 7 OUT 12 — P. M. IN 1 OUT 6
DO NOT FOLD.
DAILY TIME CARDS. The D. E. W. M. Co.

Fig. 2.—Face of Envelope, Giving Workman's Daily Record and Containing Daily Service Cards.

time the matter is investigated. Before going to the office the envelope is trimmed off, leaving only the front in the form of a card. The employee gets these in his pay envelope that he may see for himself what he is paid for.

Method of Compiling Data and Filing Cards.

The cards contained in the envelope when it is received from the workman, known as daily service time cards, serve two important purposes. The record in dollars and cents is entered in the daily cost report book, hereafter explained, where it appears both by shop departments and by general classes of products, for the convenience of the manager, and the daily record of the efficiency and productiveness of each man and machine

NAME OF PART 2-Jaw Chuck — RECORD OF PROCESS COSTS

No. of Lot	Date	Pcs. in Lot	Cost	No. of Lot	Date	Pcs. in Lot	Cost
101	Dec 3	50	.20				

Fig. 3.—Tab Card Recording Process Costs.

remains on the cards for the convenience of the superintendent. After the card record has been entered on the daily cost report the cards are distributed in the drawers of the card system, which keeps closely detailed track of labor cost and productiveness. Each card has its appointed place under the particular Machine or

NAME OF PART 2-Jaw Chuck — COST RECORD OF FINISHED PARTS

No. of Lot	Date	Pcs. in Lot	Cost	No. of Lot	Date	Pcs. in Lot	Cost
101	Dec 3	50	12.00				

Fig. 4.—Tab Card Recording Costs of Finished Parts.

Chuck which the operation has to do with. The card goes under its operation, which is a subdivision of the piece, which in turn is a subdivision of the Machine or Chuck, and also it goes under its lot number in the operation division. When the lot is completed the total cost of the one operation for the entire lot is entered upon a tab card, known as the record of process cost, Fig. 3, and the figure is included in the total cost of the piece for the lot, on a tab card devoted to this purpose, known as the cost record of finished parts, Fig. 4, and the total

cost of the piece for the lot enters into the total cost of the Machine or Chuck on a general tab card, known as cost record of finished articles, Fig. 5. Thus the company has instantly available the lot number, its number of Machines or Chuckes, its total labor cost and the cost of

Fig. 5.—Tab Card Recording Total Costs of Finished Articles.

each Machine or Chuck. The cost of each piece and operation is as quickly available. When these transfers have been made to the tab cards the daily service time cards are taken from the index and stored away for reference, not so much for use in a business way, but rather as a precaution. To render the system easier to operate the cards used in operation of Chuck manufacture are pale brown, while those of Machine manufacture are white.

Operation of Daily Cost Report Book.

In describing the operations of the daily cost report book, Fig. 6, it will be noticed that all labor cost is first divided into three general classes: A, production expense; B, operating expense, and C, investment. Under the general subdivisions of this classification there is additional subdivision in vertical columns, according to sizes, types and special contracts; the various classes

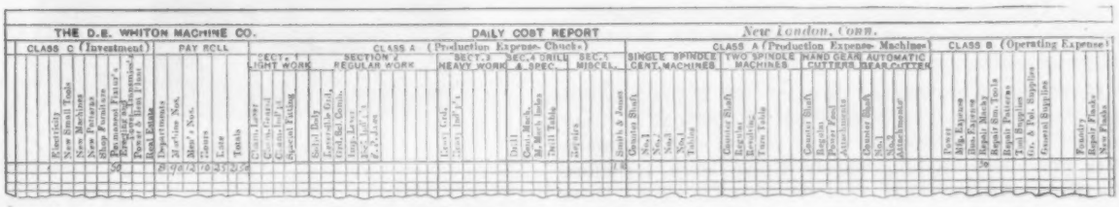


Fig. 6.—Page from Daily Cost Report Book.

of expense and investment under B and C, of which the cost of labor forms a part, are also clearly subdivided. From each workman's envelope and from the daily service time cards, before they are filed away for the superintendent, the various items contained are transferred to the daily cost report book, all the envelopes from each department being entered consecutively. Under the division of payroll are entered from each envelope the workman's number, his department letter, the total number of hours he has worked that day, his wage rate and the amount he has earned. His machine number appears on each time card, and is also entered in the payroll division. The dollars and cents value of each time card, dependent upon the number of hours worked, is also entered in items on the same line, according to the headings of the book. Take the case of workman No. 12 operating machine No. 90 in shop department B. He may have put in 2 hr. under permanent fixtures, making some new investment, which item converted into dollars and cents so that all entries in each class may be added, is entered in its proper column in class C; 2 hr. under repairing machinery in class B and 6 hr. under some special contract in class A performing an operation on Chucks in process of manufacture, for the special purposes of a customer. And so the record is kept in varying detail for each man employed.

The Total Wages for Each Man

from the face of the envelope under payroll must agree with the total dollars and cents value of the several cards entered as items on the same line in the respective classes of the daily cost report book. The footings of the columns in which labor is specified should also agree with the total payroll for the day, which makes a complete double entry system of it. Each day shows the amount of labor devoted to each classified product of the company's shops, and also by means of horizontal rulings between the various shop departments the daily cost of each classified product in each of these departments is shown, thus giving the manager a complete and valuable record, and the bookkeeper an easy weekly summary of proper entries to the various cost accounts which balance the cash paid out for payroll.

MINNESOTA HARDWARE ASSOCIATION.

AT a regular meeting of the Executive Committee of the Minnesota Retail Hardware Association on November 28 arrangements were completed for the holding of the twelfth annual convention at St. Paul. The dates selected are February 26, 27 and 28 and March 1. The headquarters will be at the Hotel Ryan, and the convention will be held at a nearby hall. Each morning will be given over to the Hardware exhibition which will be held in connection with the convention, and the regular business sessions will commence at 1.30 p.m., at which time it is requested that exhibitors close their displays, so that members can give their full attention to the convention work. Much interest is being manifested in the coming convention, and with the increased membership it is believed that this will be a large and successful meeting.

The quarterly meeting of the directors of the Retail Hardware Mutual Fire Insurance Company was also held on the same day and a gratifying statement of financial condition presented. The insurance business for the quarter showed a large increase over the amount written during the corresponding period of the previous year, and it was decided that the return premium or dividend for 1907 should be 45 per cent., payable at the expiration of policies during the coming year. This is the largest return premium in the company's history.

A NEW AXE COMPANY.

THE C. A. C. AXE COMPANY, Holbrook, Mass., which was organized several months since, is now regularly operating its plant and ready to fill orders. The company is manufacturing a full line of Axes and also a Hunter's Axe. A secret tempering process, discovered by J. Collins, president of the company, is used in the manufacture of the Axes, which are offered with high claims as to quality. F. P. Butman of Boston is secretary-treasurer of the company, which is largely a Boston enterprise, capital being furnished by a number of business men of that city. The company will maintain offices in Boston and at 97-101 Warren street, New York, the latter being in charge of Max T. Christopher, who will introduce the goods to the trade and act as sole selling agent for the United States. Mr. Christopher is qualified for this commission by having been identified with the Axe business for nearly 20 years, during eight years of which he traveled and acted as assistant manager for the Kelly Axe Mfg. Company, while for the past four years he has managed the Eastern office of the Findlay Axe & Tool Company.

E. A. PARSONS, Franklinville, N. Y., has sold his stock of Stoves and Hardware to Bartlett & Dimon.

PRICE-LISTS, CIRCULARS, &c.

Manufacturers in Hardware and related lines are requested to send us copies of catalogues, price-lists, &c., for our catalogue department in New York; and at the same time to call attention to any new goods or additions to their lines, of which appropriate mention will be made, besides the brief reference to the catalogue or price-list in this column.

STANDARD MFG. COMPANY, Shelby, Ohio: George Washington booklet relating to New Home and New Shelby Washing Machines. The latter is made with and without motor attachment.

ALLEN-SPARKS GAS LIGHT COMPANY, Lansing, Mich.: Catalogue No. 20 relating to the Princess and Allen Lighting Systems, with which gasoline is used. The catalogue also shows Inverted Gas Fixtures.

DOMINION CARTRIDGE COMPANY, Montreal, Canada: Catalogue of Metallic Cartridges, Primers, &c.

CHARLES ROSS & SON COMPANY, 148-156 Classon avenue, Brooklyn, N. Y.: Catalogue No. 5 devoted to Paint Machinery, including Paint, White Lead and Color Mills; Can Fillers, Ink Mills, Collapsible Tube Fillers, Liquid Paint Thinning, Shading and Tinting Mixers; Breakers, Lead and Putty Chasers, Rotary Pumps, &c.

JAMES L. TAYLOR MFG. COMPANY, Bloomfield, N. J.: Illustrated catalogue devoted to the Taylor Quick Adjusting, Self-Locking, High Grade Screw Clamps.

J. M. SKINNER BINDING COMPANY, Toledo, Ohio: Price-list No. 8 devoted to Bent Rims and Hounds, Surveyor Stakes and Contractors' Wheelbarrows.

AMERICAN GLUE COMPANY, Boston, Mass.: Price-lists of Sandpaper, Garnet Shoepaper and Cloth, and Alundum Paper and Cloth.

THE ASHTABULA CARRIAGE BOW COMPANY, Ashtabula, Ohio: Catalogue devoted to Bow Sockets for carriages and automobiles.

H. W. JOHNS-MANVILLE COMPANY, 100 William street, New York: Illustrated booklet of "Household Conveniences," including Asbestos Table Covers and Luncheon Mats in variety, Baking Sheets, Stove Mats, Griddles, Pie Plates, Omelet Pans, Toasters, Stove Linings, Stove Polishers, Sadiron Holders and Rests, Document Boxes, Insoles, &c., which are made wholly or partially of asbestos, according to the nature of the article.

BURLINGTON BLANKET COMPANY, Burlington, Wis.: Price-lists of Summer Goods for 1907 and of Winter Goods for 1907-1908 relating to Stay-on Burlington Horse Sheets and Horse Blankets, respectively; also a pamphlet devoted to Cow Cover and Udder Protectors. Safegert and Kuverall Blankets are new additions to the company's line.

R. M. CLOUGH, Tolland, Conn.: Catalogue and price-list representing Gear and Milling Cutters, Counterbore, Adjustable Reamers, Vertical Milling Machines, Foot and Hand Lever Shears, Presses, Punches, &c.

WILLIAM PETER ESTATE, Toledo, Ohio: Catalogue of Door and Window Screens in a variety of styles for the season of 1907.

THE PHŒNIX WIRE WORKS, Detroit, Mich.: Catalogue No. 32 relating to Grilles, Stair Railings, Stairs, Gates, Stable Fixtures, Bank Fixtures, Elevator Cars and Enclosures, Fence Vanes, Mausoleum Doors, &c.

WRIGHT WIRE COMPANY, Palmer, Mass.: Illustrated price-list of Wire Rope, Fastenings, Thimbles, Hooks and Sockets, Sheaves, &c., with tables and general information regarding transmission of power by Wire Rope and directions for splicing.

CRANDALL PACKING COMPANY, Palmyra, N. Y.: Illustrated catalogue and price-list of Steam, Ammonia and Hydraulic Packings and Engine Room Supplies.

LOUDEN MACHINERY COMPANY, Fairfield, Iowa: Illustrated catalogue of Louden's Overhead Carriers for farm, store, mill or factory, with plans for installation, &c.

A MAMMOTH ADJUSTABLE WRENCH.

WHAT is probably the largest adjustable Wrench ever made has lately been put on the market by the Coes Wrench Company, Worcester, Mass. The accompanying illustration will give an idea of its huge size. The figure alongside of the Wrench will be recognized by many as that of Frank L. Coes, who is in direction of the affairs of the company. This Wrench, which is of the well-known key model pattern, has a total length over all of 72 in. The weight of the Wrench is 166 lb., the jaw weighing 33½ lb.; screw, 5½ lb.; strap, 8½ lb.; key, 4½ lb., and bar, 114 lb. It has a 12-in. opening, with 8-in. depth of jaw. The company was prompted to make this Wrench by inquiries from bridge construction interests, and is expecting to fill orders for a number of them. In the line of key model Wrenches the company is now making four sizes—28, 36, 48 and 72 in. From this line, under ordinary conditions, constructors should be able to get a satisfactory tool for outdoor erection, especially on tank, bridge and other heavy work. The 36-in. size, we are advised, has always been found a very effective tool for opening hopper bottom cars, and a great many have been sold for this purpose. This line of Wrenches is made from steel forgings and steel castings throughout, fully case hardened and they are warranted free from all mechanical defects.

A Mammoth Adjustable Wrench.

MISCELLANEOUS NOTES.

Greenback and Delmonico Asbestos Table Covers.

H. W. Johns-Manville Company, 100 William street, New York, manufacture, in addition to numerous asbestos materials, lines of asbestos household conveniences, some of which are of recent development. Among those shown in an illustrated booklet just issued are Greenback asbestos table covers and luncheon mats, made from asbestos cloth backed on one side with white and on the other side with table felt. When the table is spread for a meal the white side should be uppermost, and at other times the cover can be reversed with the green back above, making a neat and serviceable table spread. The inner layer of asbestos protects highly finished polished or varnished hardwood tables from injury caused by the placing of hot dishes on the table cloth, the heat of which often strikes clear through cloth and ordinary table felt. They are made for round or square tables principally and for special shapes to sketch, but always to order to insure accuracy of outline. For extension tables they are made

in two sections to cover the table when closed, the intervening sections for the extended table being in sections similar in dimensions to the extra leaves. Another style is the Delmonico asbestos table cover, made from prepared asbestos board, fitted with a canton flannel cover, which may be removed and washed at will. This is also made in two sections for the closed table and with extra sections for the separate leaves, constructed so as to fold for conveniently laying away without injury.

Paradox Inkstand.

The novel inkstand shown in the accompanying cut is a product of Smith & Egge Mfg. Company, Bridgeport, Conn. All parts subjected to wear are made of metal, the standards being stamped from cold rolled steel double plated first with copper, then with nickel, and highly polished. The reservoir case, font and connecting tube are made in one piece, so that there are no joints to leak, and are cast from an alloy of metals practically noncorrosive, nickel plated or oxydized. The cap and other attachments are also nickel plated. The reservoir proper

Paradox Inkstand.

is made of Para rubber gum of guaranteed efficiency and durability. It is filled by compressing the bulb and pouring ink slowly into the font, gradually releasing the bulb, so that it will take up the ink. When the reservoir is properly filled there is no ink left in the font or tube. In dipping a pen the pressure exerted forces the bulb against the cam on the shaft above it and causes the ink to flow out into the font moistening the pen. As soon as the pen is lifted, removing the pressure on the bulb, it expands, sucking back all the ink into the reservoir, where it is free from dust and evaporation. The device may be converted into an open ink well by pressing the font down and locking it with the trigger shown in the cut. The wells are mounted single or double on a base of antique oak.

Dann's Moistener and Bal-Klos Ink Well.

Smith & Campbell, 66 E. Van Buren street, Chicago, are offering the two office specialties shown in the accom-

Fig. 1.—Dann's Moistener.

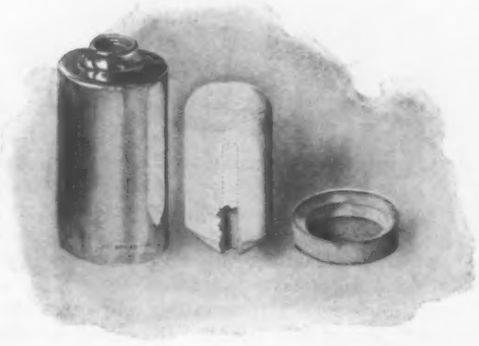
panying cuts. The moistener illustrated in Fig. 1 has an aluminum case with perforated top inclosing a felt pad. Labels, stamps and envelope flaps may be moistened by merely pressing them upon the perforated top. In the same way when counting money the figures may be moistened without coming in contact with the pad, which, being enclosed, holds its moisture, does not get hard or sticky, and is said to be perfectly sanitary. The Bal-Klos Ink Well is made of glass, the base and well being in one piece, and has a nickel top. It is shaped like a small jar.

Fig. 2.—Bal-Klos Ink Well.

Converging from the edges of the top is an inner wall. At the point of convergence is a small opening sufficient to admit the point of a pen. Over this opening is a little ball or marble which acts as a stopper, but which offers no resistance to the point of the pen and is easily displaced when dipping for ink. As soon as the pen is removed the ball naturally returns to the lowest point of the slope, covering the opening and effectually protects the ink from dust.

Germ Proof Faucet Filter.

Owing to the apparent increase of typhoid fever and other maladies resulting from city water supply, James Mfg. Company, Frick Building, Pittsburgh, Pa., with western offices at 1939 Broadway, Denver, Col., is offering the faucet filter shown in the accompanying cut. This is alluded to as a positive germ proof filter, simple in construction, durable, easily cared for, and one which can be quickly attached to or detached from either a plain or horse bib, without the use of tools or the services of a plumber. It is stated that the cost of the filter is only about half of that of the ordinary germ proof filter of cor-

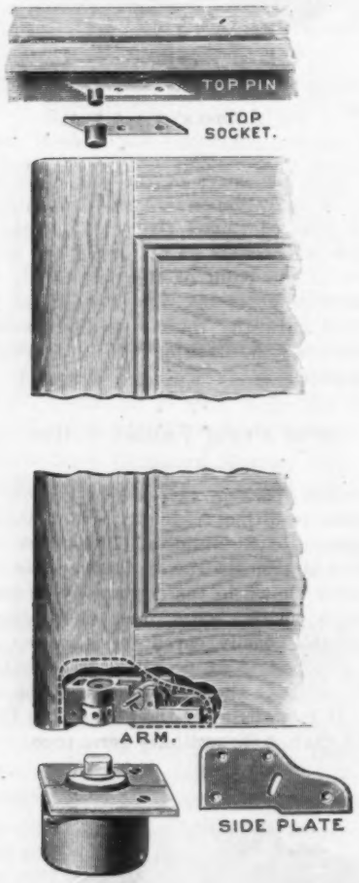


Germ Proof Faucet Filter.

responding capacity. The filter consists of three parts. The metal sheet is made in one piece, spun from sheet aluminum, highly polished, so as not to rust, or otherwise form a harmful coating by the action of water. The filtering medium is of natural Tripoli stone, which, when inserted, is loose within the casing, but when water pressure is turned on, the stone is seated against the rubber ring having an inside diameter less than the outside diameter of the stone, to make a tight joint between the casing, stone and rubber. When it is desired to use unfiltered water, the stone may first be pushed upward and to one side with the finger, in which case it is off the seat and the water then escaping between the seat and the lower end of the stone tends to wash the surface of the stone of impurities previously deposited.

Sargent's Ball-Bearing Adjustable Floor Hinges.

Sargent & Co., New Haven, Conn., and 149-153 Leonard street, New York, have recently supplemented their lines of floor hinges by the addition of the Sargent's adjustable double acting hold back floor spring hinges, as here shown, on which patent has been applied for. The peculiarity of this style of hinge is the hold back feature, by the use of which the door may be kept open at an angle of either 45 or 90 degrees by lifting with the foot the slightly projecting pin at bottom of door. In fitting the top and bottom parts the hinge is mortised into the floor with the removable cap flush with it, a separate

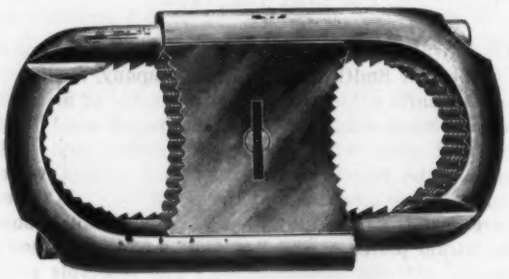


Sargent's Ball-Bearing Adjustable Tension Floor Hinge.

cast iron box being also obtainable in three depths for concrete, cement and tile floors. The bottom member contains a strong spiral spring, so connected at each end as to swing back the door to normal position when opened either way, unless the short projecting pin is forced down by the foot to lock it for the time at either angle, thus providing a self-contained hinge that obviates the necessity for a door holder. Releasing the door is accomplished by a slight upward lift by the foot of the locking pin. The mechanism can be oiled occasionally by removing the top cap and using an oil hole and runway provided, the tension likewise being adjustable without removing the door. The top pin and top socket are mortised into the door and head of door frame, as indicated in the illustration. There is also provision for properly centering the door between the jambs to overcome any possible moderate inaccuracy in mortising the hinge parts, by merely tightening or loosening machine screws covered by the side plates. The hinges are made regularly in eight finishes of iron and four finishes of bronze metal, suitable for doors ⅞ to 1½ in., 1⅜ to 2 in. and 2 to 2½ in. thick, and depths of cut 3 1-16, 3 5-16 and 3⅜ in., respectively. They can be supplied both with and without side plates, and are put up one set in a box, with screws to match. As sent out the hinges are adjusted to proper tension, but can be easily altered at will.

Tower's Thumb Cuff.

The Tower & Lyon Company, 95 Chambers street, New York, has added to its extensive line of police accessories the Tower's thumb cuff, here illustrated, actual size. Its chief novelty is the unobtrusive security and comparatively small size, making of it a vest pocket article, while sacrificing nothing in necessary strength. The two members, of malleable iron polished and nickeled, slide on each other with a ratchet movement. In use the cuff is

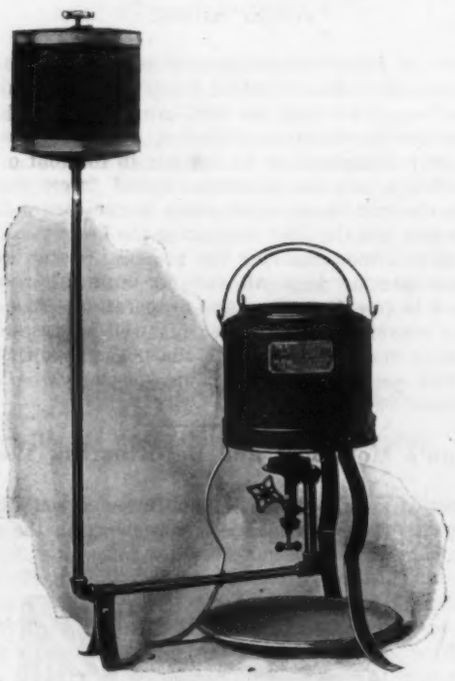


Tower's Thumb Cuff.

slipped over a prisoner's thumbs and the two parts instantly and automatically locked by pushing them closer together between the two joints until a close union is made, according to the anatomy of the individual handcuffed. The device not only restrains the captive, but he need not necessarily attract attention to his condition, as the hands can be easily covered in various ways. The cuff is opened by means of a flat steel key and is specially recommended for use by detectives and policemen, as well as other law officers using such devices.

A New Glue Pot Heater.

The glue pot and glue pot heater shown herewith are made of extra heavy copper. The gasoline burner and gasoline receptacle are made in the usual manner. The



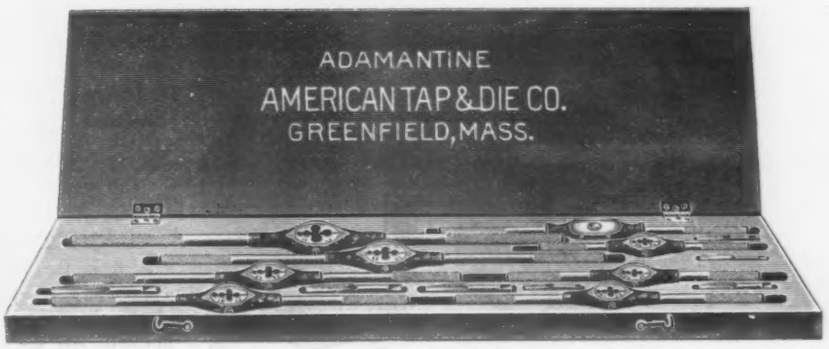
A New Glue Pot Heater.

device is designed to enable small glue users to have a supply of fresh hot glue handy to their work. It is put on the market by the Advance Machinery Company, Toledo, Ohio.

W. J. Waters has purchased the business of Iowa Hardware Company, Murray, Iowa.

Full Mounted Screw Plate Sets.

American Tap & Die Company, Greenfield, Mass., is putting up its full mounted screw plates in sets as shown herewith. An illustrated description of the screw plate was given in our columns May 17 last. The stocks have gun metal bodies, with genuine bicycle steel tubing handles that are knurled in an attractive manner. They contain Eagle brand dies, which can be removed from the stocks and used independently in any other stock taking the same diameter. The dies can also be adjusted to obtain a tight or loose fit. The sets also contain the company's new model of tap wrench, which is quick opening, the mechanism being operated by turning one of the handles. The sets are mounted in full polished hardwood cabinets, as shown in the illustration, each stock carrying one die, which cuts a perfect thread at a single operation.



Full Mounted Screw Plate Sets.

Perkins Concrete Hanger Socket.

Perkins & Howland, 214 Worthington street, Springfield, Mass., are manufacturing Perkins concrete hanger sockets, as shown in the accompanying illustrations. The

Fig. 1.—Perkins Concrete Hanger Socket.

sockets of cast iron are bolted to the platform before the concrete is put on. After the concrete work is done the bolts are removed and hangers made from iron rods

Fig. 2.—Method of Inserting or Removing Nut in the Imbedded Socket.

of required length and shape can be screwed into the nut, which is inserted in the manner indicated by the cut, Fig. 2. This nut can be readily removed by tilting it on end and a new nut substituted if for any reason the thread becomes injured. The hangers can be used for side walls as well as overhead work. They are made in four sizes suitable for ⅜, 7-16 or ½, ⅝ and ¾ in. bolt diameter, and are capable of carrying lines of pipe, shafting, &c., larger sizes being obtainable for heavy work. Fig. 1, it will be observed, has a portion of the lower end cut away to show the inner construction.

The N. T. C. Tap Chuck.

The National Tool Company, Cleveland, Ohio, has recently placed upon the market the N. T. C. tap chuck here illustrated. The hub or body is a single piece, cut from solid bar steel. There are two sets of jaws and two screws made of high grade tool steel, carefully tempered and drawn to the proper degree of hardness. The large jaws grip the round part of tap shank centering it; while the adjacent small jaws grip the square end and resist the tortional strains when tap is in service. It is explained that excessive tightening of the screws is unnecessary, for by reason of the design and proportion, a tap would break before it could turn in the jaws, even if they

Fig. 1.—The N. T. C. Tap Chuck.

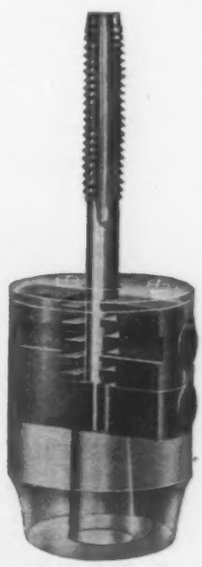


Fig. 2.—Sectional View of Chuck.

were set up only gently. These jaws also take up any inequality due to imperfect squaring of the tap shank. This chuck is at present made in but one size, with capacity from 5-32 to 7-16 tap. The hole in hub is made to fit taper arbor, but can be bored and threaded to suit special templets. It is also made in combination with automatic-releasing shank for turret machine work. The advantages claimed for this tool by the manufacturer are the positive drive and the elimination of the necessity of making special taps and special holders where the standard or commercial taps may be used. It may also be used as a positive drive drill chuck if the shank of the drill is squared at the end so that the smaller jaws of the chuck may have a grip; or by reversing small jaws and grinding parallel flat surfaces on end of drill shank the same results may be obtained.

The Taylor Quick Adjusting Self-Locking Carpenters' Clamp.

James L. Taylor Mfg. Company, Bloomfield, N. J., is offering the carpenters' clamp shown in Fig. 1. The castings are all of steel. It has a 1¾ x 5-16 in. high grade steel bar and ¾-in. steel screw. The clamp will take a clamping strain of 20,000 lb. and is well adapted

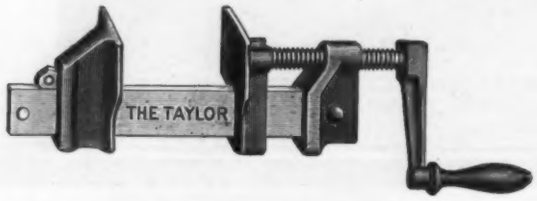


Fig. 1.—The Taylor Quick Adjusting Self-Locking Carpenters' Clamp No. 30.

to heavy doors and hardwood work. The bars have no notches, and the action is quick, because no time is taken up when adjusting in locating the nearest available notch. In Fig. 2 is illustrated the improved self-locking grip, in the action of which the principle of the wedge is applied. A series of severe tests has demonstrated that the head will not slip under any strain that can be applied, even when it is brought to bear directly at the

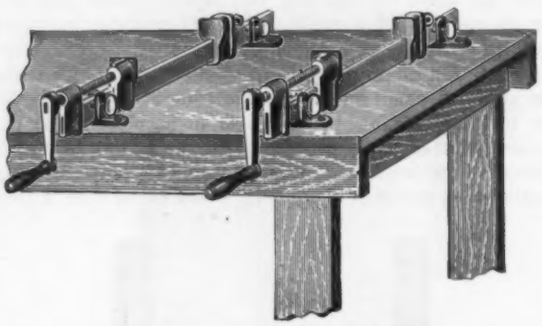


Fig. 3.—Clamps Secured on Bench by Clamp Supports.

base. In shifting the head the projecting end of the wedge is grasped between the thumb and second finger, Fig. 2, the first finger pressing slightly against the head. This releases the wedge and the head may be moved back any distance desired. In moving the head forward it is pushed along the bar to any point or against the work and it grips the bar instantly wherever it is left. Clamp supports, or holders, may be obtained, as shown in Fig. 3, the supports being screwed fast to a bench or wooden

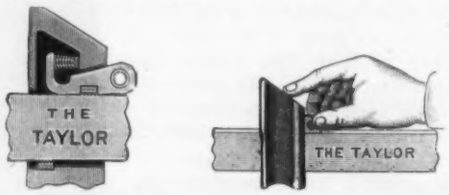
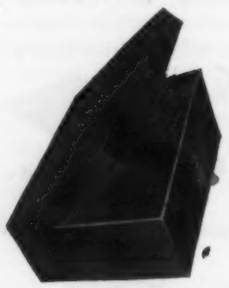


Fig. 2.—Improved Gripping Action on Clamp.

horses to hold the clamps rigidly in position. The supports each have a thumbscrew to be screwed against the clamp bar. At the same time the clamps can be removed in a moment for use elsewhere if desired. The clamps are made in 10 lengths to open from 2 to 10 ft.

Asbestos Transite Document Box.

The H. W. Johns-Manville Company, 100 William street, New York, is manufacturing the asbestos Transite document box, which the company refers to as absolutely fireproof. The box is designed to be a convenient receptacle for cash and valuable documents, such as leases, policies, mortgages, deeds, &c. It is said to pos-



Asbestos Transite Fireproof Document Box.

sess the highest fire resisting qualities, being made of Transite asbestos board, and therefore capable of preserving its contents intact in the event of fire. The boxes are covered on the outside with green leatherette and trimmed with brass handle, lock and hinges. At present they are made in four sizes, from 10 to 18 in. long, 6 to 12 in. wide and 3 to 6 in. high.

PAINTS, OILS AND COLORS

Animal, Fish and Vegetable Oils—

	℔ gal.	
Linseed, City, raw	42	@43
City, Boiled	43	@44
State and Western, raw	41	@42
Raw Calcutta, in bbls	70	@..
Lard, Extra Prime, Winter	78	@79
Extra No. 1	51	@52
No. 1	45	@49
Cotton-seed, Crude, f.o.b. mills	..	@..
Summer Yellow, Prime	41	@43
Summer White	..	@52
Sperm, Crude	52	@53
Natural Winter	65	@66
Bleached Winter	68	@69
Bleached Winter, Extra	70	@72
Tallow, Prime	56	@57
Whale, Crude	35	@36
Natural Winter	45	@46
Bleached Winter	47	@48
Extra Bleached Winter	49	@50
Menhaden, Brown, Strained	32	@35
Light, Strained	32	@35
Northern	28	@..
Southern	27	@..
Cocoanut, Ceylon	℔ lb 9	@..
Cochin	℔ lb 9¾	@..
Cod, Domestic, Prime	30	@35
Newfoundland	34½	@36
Red, Elaine	48	@51
Saponified	℔ lb 6¾	@ 7
Olive, Italian, bbls	65	@70
Neatsfoot, Prime	49	@50
Palm, Logos	℔ lb 7¼	@ 7½

Mineral Oils—

	℔ gal.	
Black, 29 gravity, 25@30 cold test	10½	@11¼
29 gravity, 15 cold test	11¼	@12½
Summer	10¼	@11½
Cylinder, light filtered	18	@19
Dark, filtered	16	@17
Paraffine, 903-907 gravity	13¼	@14
903 gravity	12¾	@13
983 gravity	10¼	@10¾
Red	12½	@14

Miscellaneous—

Barytes:		
White, Foreign	℔ ton	$18.50@20.00
Amer. floated	℔ ton	19.00@.....
Off color	℔ ton	11.50@15.50
Chalk, in bulk	℔ ton	3.00@ 3.25
In bbls	℔ 100 lb	....@ .35
China Clay, English	℔ ton	11.00@17.00
Cobalt, Oxide	℔ 100 lb	2.50@ 2.60
Whiting, Commercial	℔ 100 lb	.45@ .48
Gilders	℔ 100 lb	.50@ .55
Ex. Gilders	℔ 100 lb	.55@ .60

Putty, Commercial—℔ 100 lb

In bladders	$1.70	@1.85
In bbls. or tubs	1.20	@1.40
In 1 lb to 5 lb cans	2.65	@2.95
In 12½ to 50 lb cans	1.50	@1.90

Spirits Turpentine—℔ gal.

In Oil bbls	69½	@70
In machine bbls	70	@70½

Glue—

	℔ lb	
Cabinet	11	@15
Common Bone	7	@ 9
Extra White	18	@24
Foot Stock, White	11	@14
Foot Stock, Brown	8	@11
German Hide	12	@18
French	10	@40
Irish	13	@16
Low Grade	9	@12
Medium White	14	@17

Gum Shellac—

	℔ lb	
Bleached Commercial	47	@48
Bones, Dried	57	@59
Button	40	@50
Diamond I	54	@55
Fine Orange	50	@52
A. C. Garnet	48	@50
Kala Button	37	@38
G. A. L. Garnet	45	@45½
D. C	58	@60
Octagon B	..	@54
T. N	48	@49
V. S. O	..	@55

Colors in Oil—

	℔ lb	
Black, Lampblack	12	@14
Blue, Chinese	36	@46
Blue, Prussian	32	@36
Blue, Ultramarine	13	@16
Brown, Vandyke	11	@14
Green, Chrome	12	@16
Green, Paris	..	@24
Sienna, Raw	12	@15
Sienna, Burnt	12	@15
Umber, Raw	11	@14
Umber, Burnt	11	@14

White Lead, Zinc, &c.—

	℔ lb	
Lead, American White:		
Lots of 500 lb or over, in Oil	..	@ 7
Lots less than 500 lb, in Oil	..	@ 7¼
Dry in Barrels	..	@ 6½
Lead, English white, in Oil	..	@10
Lead, White, in oil, 25 lb tin pails, add to keg price	..	@ ¼
Lead, White, in oil, 12½ lb tin pails, add to keg price	..	@ 1
Lead, White, in oil, 1 to 5 lb ass'ted tins, add to keg price	..	@ 1½

Lead, American. Terms: For lots 12 tons and over ¼¢ rebate; and 2% for cash if paid in 15 days from date of invoice; for lots of 500 lbs. and over 2% for cash if paid in 15 days from date of invoice, for lots of less than 500 lbs. net.

	℔ lb	
Zinc, American, dry	5¾	@ 5½
Zinc, French:		
Antwerp, Red Seal, dry	8¾	
Antwerp, Green Seal, dry	10¾	
Paris, Red Seal, dry	9¼	
Paris, Green Seal, dry	11	

Zinc, V. M. French, in Poppy Oil:
Green Seal:
Lots of 1 ton and over 13¼@13¾
Lots of less than 1 ton 13⅝@13¾

Zinc, V. M. French, in Poppy Oil:
Red Seal:
Lots of 1 ton and over 11¾@12¾
Lots of less than 1 ton 12⅛@12⅝

Discounts.—French Zinc.—Discounts to buyers of 10 bbl. lots of one or mixed grades, 1%; 25 bbls., 2%; 50 bbls., 4%.

Dry Colors—

	℔ lb	
Black, Carbon	6½	@11
Black Drop, American	4	@ 6
Black Drop, English	5	@15
Black, Ivory	16	@20
Lamp, Com	4	@ 6
Blue, Celestial	4	@ 6
Blue, Chinese	29	@32
Blue, Prussian	27	@30
Blue, Ultramarine	4½	@15
Brown, Spanish	½	@ 1
Carmine, No. 40	$3.00	@5.05
Green, Chrome, ordinary	3½	@ 6
Green, Chrome, pure	17	@25

Lead, Red, bbls., ½ bbls. and kegs:

Lots 500 lb or over	..	@ 7¼
Lots less than 500 lb	..	@ 7¾
Litharge, American, bbls	7¼	@ 7¾
Ocher, American	℔ ton	$8.50@16.00
American Golden	2½	@ 3½
French	1¾	@ 2½
Foreign Golden	3	@ 4
Orange Mineral, English	10	@12
French	10¾	@12
German	8½	@10
American	8½	@ 8¾
Red, Indian, English	4½	@ 8½
American	3	@ 3¼
Red, Turkey, English	4	@10
Red, Tuscan, English	7	@10
Red, Venetian, Amer.	℔ 100 lb	$0.50@1.25
English	100 lb	$1.15@1.75

Sienna, Italian, Burnt and Powdered:

Italian, Raw, Powdered	3	@ 6¼
American, Raw	1½	@ 2
American Burnt and Pow'd.	1½	@ 2
Talc, French	℔ ton	$17.00@25.00
American	℔ ton	17.00@25.00
Terra Alba, French	℔ 100 lb	.90@ 1.00
English	℔ 100 lb	.80@ 1.00
American	℔ 100 lb, No. 1	.75@ .80
American	℔ 100 lb, No. 2	.60@ .65
Umber, T'key, Bnt. & Pow.	2½	@ 3½
Turkey, Raw and Powdered	2½	@ 3½
Burnt, American	1½	@ 2
Raw, American	1½	@ 2
Yellow Chrome	12	@14
Vermilion, American Lead	10	@25
Quicksilver, bulk	65	@..
Quicksilver, bags	..	@66
English, Imported	65	@70
Chinese	$0.90	@1.00

Current Hardware Prices.

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer—are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33⅓ @ 33⅓ & 10% signifies that the price of the goods in question ranges from 33⅓ per cent. discount to 33⅓ and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued May, 1906, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Adjusters, Blind—

Domestic, ℔ doz. $3.00.....33⅓%
North's 10%
Zimmerman's—See Fasteners, Blind.

Window Stop—

Ives' Patent.....35%
Taplin's Perfection.....35%

Ammunition—See *Caps, Cartridges, Shells, &c.*

Anti-Rattlers—

Fernald Mfg. Co. Burton Anti-Rattlers, ℔ doz. pairs, Nos. 1, $0.75; 2, $0.60; 4, $1.00; 5, $0.50.
Fernald Quick Shifter, ℔ doz. pairs .....$2.00@$3.00

Anvils—American—

Eagle Anvils.....℔ lb @8½¢
Hay-Budden, Wrought.....9½@9¾¢
Trenton .....℔ lb 9½@9¾¢

Imported—

Peter Wright & Sons, ℔ lb, 84 to 340 lb, 11¢; 350 to 600 lb, 11½¢.

Anvil, Vise and Drill—

Millers Falls Co., $18.00.....15&10%

Apple Parers—See *Parers, Apple, &c.*

Aprons, Blacksmiths'—

Livingston Nail Co.....33⅓%

Augers and Bits—

Com. Double Spur.....75@75&10%
Jennings' Pats., reg. finish.... 60&5@60&10%
Black Lip or Blued...65@65&5%
Boring Mach. Augers.....70&10%
Car Bits, 12-in. twist.....50&10%
Ford's Auger and Car Bits.....40&5%
Ft. Washington Auger Co., Conard's 35%
Forstner Pat. Auger Bits.....25%
C. E. Jennings & Co.:
No. 10 ext. lip. R. Jennings' list..25%
No. 30, R. Jennings' list.....40&7½%
Russell Jennings'.....25&10&2½%
L'Hommedieu Car Bits.....12½%
Mayhew's Countersink Bits.....45%
Pugh's Black.....20%
Pugh's Jennings' Pattern.....35%
Snell's Auger Bits.....60%
Snell's Bell Hangers' Bits.....60%
Snell's Car Bits, 12-in. twist.....60%
Snell's King Auger Bits.....50%
Wright's Jennings' Bits.....50%

Bit Stock Drills—

See *Drills, Twist.*

Expansive Bits—

Clark's small, $18; large, $26....50&10%
Clark's Pattern, No. 1, ℔ doz. $36; No. 2, $18.....60&10&10%
Ford's, Clark's Pattern.....60%
C. E. Jennings & Co., Steer's Pat. 25%
Lavigne Pat., small size, $18.00; large size, $26.00.....70&10%
Swan's 60%

Gimlet Bits—

Per gro.
Common Dble. Cut....$3.00@3.25
German Pattern, Nos. 1 to 10, $4.75; 11 to 13, $5.75

Hollow Augers—

Bonney Pat., per doz..$5.50@6.00
Ames .....25&10%
Universal 20%
Wood's Universal.....25%

Ship Augers and Bits—

Ship Augers.....45&5@—%
Ford's .....33⅓&5%
C. E. Jennings & Co.:
L'Hommedieu's 15%
Watrous' .....33⅓&7½%
Snell's 40%

Awl Hafts—See *Handles, Mechanics' Tool.*

Awls—

Brad Awls:
Handled .....gro. $2.75@3.00
Unhdled, Shldered...gro.63@66¢
Unhandled, Patent..gro.66@70¢
Peg Awls:
Unhandled, Patent..gro. 51@54¢
Unhdled, Shldered..gro. 65@70¢
Scratch Awls:
Handled, Com...gro. $3.50@4.00
Handled, Socket..gro.$11.50@12.00

Awl and Tool Sets—See *Sets, Awl and Tool.*

Axes—

Single Bit, base weights: Per doz.
First Quality.....$4.75@5.00
Second Quality.....$4.25@4.50
Double Bit, base weights:
First Quality.....$7.00@7.50
Second Quality.....$6.50@6.75

Axle Grease—

See *Grease, Axle*

Axles—Iron or Steel

Concord, Loose Collar..4½@5 ¢
Concord, Solid Collar...4¾@5¼¢
No. 1 Common, Loose..3½@4 ¢
No. 1½ Com., New Style3¾@4¼¢
No. 2 Solid Collar.....3¾@4¼¢
Half Patent:
Nos. 7, 8, 11 and 12....70@75%
Nos. 13 to 14.....70@75%
Nos. 15 to 18.....75@75&5%
Nos. 19 to 22.....75@75&5%

Boxes, Axle—

Common and Concord, not turned lb., 4½@5¢
Common and Concord, turned. lb., 5½@6¢
Half Patent.....lb., 9½@10¢

Bait—Fishing—

Hendryx:
A Bait.....20%
B Bait.....25%
Competitor Bait.....20&5%

Balances—Sash—

Caldwell new list.....50%
Pullman .....50&10@60%

Spring—

Spring Balances.....50&10@60%
Chatillon's:
Light Spg. Balances.....50&10%
Straight Balances.....40@50%
Circular Balances.....50&10%
Large Dial.....30%

Barb Wire—See *Wire, Barb.*

Bars—Crow—

Steel Crowbars, 10 to 40 lb.... per lb., 3@3½¢

Towel

No. 10 Ideal, Nickel Plate..℔ gro. $8.50

Beams, Scale—

Scale Beams.....40&5@40&10%
Chattillon's No. 1.....30%
Chattillon's No. 2.....40%

Beaters, Carpet—

Holt-Lyon Co.:
No. 13 Wire Tinned ℔ doz.....$0.75
No. 12 Wire Coppered ℔ doz, $0.75; Tinned $0.85
No. 11 Wire Coppered ℔ doz. $1.10; Tinned $1.20
No. 10 Wire Galvanized..℔ doz. $1.50
Western W. G. Co.:
No. 1 Electric.....℔ gro. $7.80
No. 2 Buffalo.....℔ gro. $9.00
No. 3 Perfection Dust.....℔ gro. $8.00

Egg—

Holt-Lyon Co.:
Holt, per doz., No. 5, $0.80; No. 1, Jap'd, $1.15; No. 1, Tin'd, $1.40; No. B, Jap'd, $1.85; No. 2, Tin'd, $2.25; No. 6, $1.60.
Lyon, Jap'd, per doz., No. 2, $1.35.
Taplin Mfg. Co.:
Improved Dover, per gro., No. 60, $6.00; No. 75, $6.50; No. 100, $7.00; No. 102, Tin'd, $8.50; No. 150, Hotel, $15.00; No. 152, Hotel Tin'd, $17.00; No. 200, Tumbler, $8.50; No. 202, Tumbler Tin'd, $9.50; No. 300, Mammoth, per doz., $25.00.
Turner & Seymour Mfg. Co.:
T. & S. Dover.....$6.00
Western, W. G. Co., ℔ gro., Buffalo, No. 2, $8.00; Perfection, No. 3, $9.00.
Wonder (R M. Co.)..℔ gro. net, $6.25

Bellows—

Blacksmith, Standard List..
Split Leather.....65%
Grain Leather.....60%

Hand—

Inch..	*6*	*7*	*8*	*9*	*10*
Doz...	*$5.50*	*6.15*	*6.60*	*7.15*	*7.70*

Net Prices.

Molders—

Inch..	*9*	*10*	*11*	*12*	*14*
Doz...	*$8.00*	*9.00*	*10.50*	*12.50*	*14.50*

Bells—Cow—

Ordinary Goods...75&5@75&10&5%
High grade.....70&10@75%
Jersey .....75&10%
Texas Star.....50%

Door—

Abbe's Gong.....45%
Barton Gong.....50%
Home, R. & E. Mfg. Co.'s.....55&10%
Trip Gong.....50&10@50&10&5%
Yankee Gong.....55%

Hand—

Polished, Brass.....60&10%
White Metal.....60%
Nickel Plated.....50&10@60%
Swiss .....50&10@50&10&5%
Cone's Globe Hand Bells.....33⅓@33⅓
Silver Chime.....33⅓@33⅓

Miscellaneous—

Farm Bells.....lb., 2¼@2½¢
Church and School.....60%
Table Call Bells.....50@50&10%

Belting—Leather—

Extra Heavy, Short Lap..60&5%
Regular Short Lap....60&10&5%
Standard 70%
Light Standard.....70&5%
Cut Leather Lacing.....45%
Leather Lacing Sides, per sq. ft. 25¢

Rubber—

Agricultural (Low Grade).... 75@75&5%
Common Standard....70@70&10%
Standard .....60&5@60&10%
Extra .....60@60&5%
High Grade.....50&5@50&10%

Bench Stops—

See *Stops, Bench*

Benders and Upsetters, Tire—

Detroit Perfected Tire Bender.....40%
Detroit Stoddard's Lightning Tire Upsetters, No. 1, $4.25; No. 2, $7.25; No. 3, $10.50; No. 4, $16.25; No. 5, $20.50.
Green River Tire Benders and Upsetters 20%

Bicycle Goods—

John S. Leng's Son & Co.'s 1906 list: Chain, Parts, Spokes.....50%
Tubes 60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See *Augers and Bits.*

Blocks—Tackle—

Common Wooden.....75%
Hartz St. Tackle Blocks.....50@50&5%
B. & L. B. Co.:
Boston Wood Snatch, 50%; Eclipse Steel, 75%; Hollow Steel, 50&10%; Star Wire Rope, 50%; Tarbox Metal Snatch, 50%; Tarbox New Style Steel, 50&10%; Wire Rope Snatch, 50%.
Lane's Patent Automatic Lock and Junior 30%
Stowell's Novelty, Mal. Iron.....50%
Stowell's Loading.....50&10%
See also Machines, Hoisting.

Boards, Stove—

Zinc, Crystal, &c.....40%
Paper Embossed.....40&10%

Boards, Wash—

See *Washboards.*

Bobs, Plumb—

Greuffel & Esser Co.....33⅓%

Bolts—

Carriage, Machine, &c.—

Common Carriage (cut thread): ⅜ × 6 and smaller.70&12½@—%
Larger and Longer.60&2½@—%
Phila. Eagle $3.00 list May 21, '99 40%
Bolt Ends.....65@65&5%
Machine, ⅜ x 4 and smaller.. 70&12½@—%
Machine, larger and longer.. 60&7½@—%

Door and Shutter—

Cast Iron Barrel, Japanned, Round Brass Knob:

Inch.....	*3*	*4*	*5*	*6*	*8*
Per doz.	*$0.30*	*.35*	*.45*	*.60*	*.80*

Cast Iron Spring Foot, Jap'd:

Inch.....	*6*	*8*	*10*
Per doz.....	*$1.20*	*1.50*	*2.25*

Cast Iron Chain, Flat, Japanned:

Inch.....	*6*	*8*	*10*
Per doz.....	*$1.00*	*1.40*	*1.65*

Cast Iron Flat Shutter, Jap'd., Brass Knobs:

Inch.....	*6*	*8*	*10*
Per doz.....	*$0.75*	*.95*	*1.25*

Wrought Barrel Japd..80@80&10%
Barrel Bronzed.....60&10%
Spring .....70&10@70&10&10%
Shutter .....50&5@50&10&5%
Square Neck.....75@75&10%
Square .....70&10&10%
Ives' Patent Door.....50%

Plow and Stove—

Plow .....65&10@—%
Stove .....85&10%

Tire—

Common Iron.....80%
Norway Iron.....80%
American Screw Company:
Norway Phila., list Oct. 16, '84...80%
Eagle Phila., list Oct. 16, '84....82½%
Bay State, list Dec. 28, '99.....80%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '84...80%
Eagle Phila., list Oct. 16, '84....62½%
Eclipse, list Dec. 28, '99.....80%
Mount Carmel Bolt Co.:
Norway Phila., list Oct. 16, '84....80%
Eagle Phila., list Oct. 16, '84....82½%
Mount Carmel, list Dec. 28, '99...80%
Russell, Burdsall & Ward Bolt & Nut Co.:
Empire, list Dec. 28, '99.....80%
Norway Phila., list Oct., '84.....80%
Upson Nut Co.:
Tire Bolts.....72½%

Borers, Tap—

Borers Tap, Ring, with Handle:

Inch.....	*1¼*	*1½*	*1¾*	*2*
Per doz...	*$4.80*	*5.60*	*6.40*	*8.00*
Inch	*2¼*	*2½*		
Per doz.....	*$6.65*	*11.50*		

Enterprise Mfg. Co., No. 1, $1.25; No. 2, $1.75; No. 3, $2.50 each.....25%

Boxes, Mitre—

C. E. Jennings & Co.....30%
Langdon, New Langdon and Langdon Improved, 20&10%; Langdon Acme .....15&10%
Perfection 40%
Seavey 40%
Stanley R. & L. Co.: Nos. 240 to 460, 30%; Nos. 50 and 60.....35%

Braces—

Common Ball, American..$1.25@1.30
Barber's .....50&10&10@60&10%
Fray's Genuine Spofford's.....60%
Fray's No. 70 to 120, $1 to 123, 207 to 414 .....60%
C. E. Jennings & Co.....50&5%
Mayhew's Ratchet.....60%
Mayhew's Quick Action Hay Pat...50%
Millers Falls Drill Braces.....25&10%
P., S. & W. Co., Peck's Pat.60@60&5%
Stanley R. & L. Co.:
Stanley, 35%; Victor.....45%

Brackets—

Wrought Steel.....80@80&5%
Griffin's Pressed Steel.....75&10&80%
Griffin's Folding Brackets.....70&10%
Stowell's Cast Shelf, 75%; Sink..50%
Western, W. G. Co., Wire.....60&10%

Bright Wire Goods—

See *Wire and Wire Goods.*

Broilers—

Kilbourne Mfg. Co.....75&20%
Western, W. G. Co.....80%
Wire Goods Co.....75@75&10%

Buckets, Galvanized—

Price per dozen.

Quart.....	*10*	*12*	*14*
Water, Regular...	*1.40*	*1.70*	*1.90*
Water, Heavy....	*3.40*	*3.70*	*3.80*
Fire, Rd. Bottom..	*2.30*	*2.55*	*2.95*
Well	*2.55*	*2.87*	*3.15*

Bucks, Saw—

Hoosier.....℔ gro. $36.00

Bull Rings—See *Rings, Bull*

Butts—Brass—

Wrought 50%
Cast Brass, Tiebout's.....50%

Cast Iron—

Discount.
Fast Joint, Broad....40&10%
Fast Joint, Narrow...40&10@50%
Loose Joint.....70&10@75%
Loose Pin.....70&10@75%
Mayer's Hinges.....70@70&5
Parliament Butts.....70@70&5

Wrought Steel—

Discount.
Reversible and Broad..75%
Light Reversible, Light Narrow 75%
Loose Joint, Narrow, Lt Inside Blind, etc.70&10%
Back Flaps, Table, Chest 70%

Extra, 10@20%

Cages, Bird—

Hendryx Brass: Series 3000, 5000, 1100, 10%; 1200, 25%; 200, 300, 600, 900 .....%
Hendryx Bronze: Series 700, 800..40%
Hendryx Enameled.....40%

Calipers—See *Compasses.*

Calks, Toe and Heel—

Blunt, 1 prong....per lb., 4@4½¢
Sharp, 1 prong...per lb., 4½@4¾¢
Burke's Blunt, 4@4¼¢; Sharp, 4½@4¾¢
Gautier, Blunt, 4@4¼¢; Sharp, 4½@4¾¢
Perkins', Blunt, ℔ lb, 3.65¢; Sharp, 4.15¢

Can Openers—
See *Openers, Can.*

Cans, Milk—

	5	8	10 gal.
Illinois Pattern	$1.35	1.85	2.35 each.
New York Pattern	1.50	2.20	2.45 each.
Baltimore Pattern	1.50	2.20	2.45 each.
Dubuque	1.35	1.60	1.75 each.

Cans, Oil—

Buffalo Family Oil Cans:

3	5	10 gal.
$18.00	60.00	129.60 gro., net.

Caps, Percussion—

Eley's E. B.....58@55¢
G. D.....per M 34@35¢
F. L.....per M 40@42¢
G. E.....per M 48@50¢
Musket.....per M 62@63¢

Primers—

Berdan Primers, $2 per M..20&5%
Primer Shells and Bullets. 15&10%
All other primers per M.$1.5%@1.60

Cartridges—

Blank Cartridges:
32 C. F., $5.50.....10&5%
38 C. F., $7.00.....10&5%
22 cal. Rim, $1.50.....10&5%
32 cal. Rim, $2.75.....10&5%
B. B. Caps, Con. Ball, Swgd. $1.90
B. B. Caps, Round Ball....$1.40
Central Fire.....25%
Target and Sporting Rifle..15&5%
Primed Shells and Bullets.15&10%
Rim Fire, Sporting.....50%
Rim Fire, Military.....15&5%

Casters—

Bed.....70@70&10%
Plate.....60&10@60&10&5%
Philadelphia.....75@75&10%
Acme, Ball Bearing.....33⅓%
Boss.....70&10%
Boss Anti-Friction.....70&10%
Gem (Roller Bearing).....80%
Martin's Patent (Phoenix).....45%
Standard Ball Bearing.....45%
Tucker's Patent low list.....30%
Yale (Double Wheel) low list.....50%

Cattle Leaders—
See *Leaders, Cattle.*

Chain, Coil—

American Coil, Straight Link:

3-16	¼	5-16	⅜	7-16	½	9-16
$8.90	6.10	5.10	4.40	4.25	4.15	4.10
⅝	¾	⅞	to 1 1-16	1⅛	to 1¼	inch.
$4.00	3.90	3.85		3.95		

German Coil.....60&10&10@70%

Halter—

Halter Chains.....60&5@60&10%
German Pattern Halter Chains, list July 24, '97.....60&10&10%
Covert Mfg. Co.
Halter.....35&5%

Cow Ties—
See *Halters and Ties.*

Trace, Wagon, &c.—

Traces, Western Standard: 100 pr.
6¼—6-3, Str'ght, with ring..$25.00
6¼—6-2, Str'ght, with ring..$26.00
6¼—8-2, Str'ght, with ring..$30.00
6¼—10-2, Str'ght, with ring..$35.00

NOTE.—Add 2c per pair for Hooks. Twist Traces; add per pair for Nos. 2 and 3, 2c; No. 1, 3c; No. 0, 4c to price of Straight Link.

Eastern Standard Traces, Wagon Chain, &c.....60&10%

Miscellaneous—

Jack Chain, list July 10, '93:
Iron.....60&10%
Brass.....60&5%
Safety and Plumbers' Chain..70%
Gal. Pump Chain.....lb. 4@4½%
Covert Mfg. Co.:
Breast, Halter, Heel, Rein, Stallion.....40%
Oneida Community:
Am. Dog Leads and Kennel Chains. 40@40&5%
Niagara Dog Leads and Kennel Chains.....45@60&5%
Wire Goods Co.:
Dog Chain.....70&10%
Universal Dbl.-Jointed Chain.....50%

Chain and Ribbon, Sash—

Oneida Community:
Copper Chain, 60&5%; Steel Chain, 60%
Pullman:
Bronze Chain, 60%; Steel Chain, 60&10%
Sash Chain Attachments, per set..8¢
Aluminoy Sash Ribbon, per 100 ft.....$1.25@$3.00
Sash Ribbon Attachments, per set..8¢

Chalk—(From Jobbers.)

Carpenters' Blue....gro., 50@55¢
Carpenters' Red.....gro., 45@50¢
Carpenters' White...gro., 40@45¢

Checks, Door—

Bardsley's.....45%
Pullman, per gro.....$54.00
Russwin.....33⅓%

Chests, Tool—

American Tool Chest Co.:
Boys' Chests, with Tools.....55%
Youths' Chests, with Tools.....40%
Gentlemen's Chests, with Tools..30%
Farmers', Carpenters,' etc., Chests, with Tools.....30%
Machinists' and Pipe Fitters' Chests, Empty.....50%
Tool Cabinets.....50%
C. E. Jennings & Co.'s Machinists' Tool Chests.....33⅓&10%

Chisels—

Socket Framing and Firmer

Standard List.....75@75&5%
Buck Bros.....30%
Charles Buck Edge Tool Co.....30%
C. E. Jennings & Co.:
Socket Firmer No. 19.....60%
Socket Framing No. 15.....60%
Swan's.....75%
L. & I. J. White Co.....30@30&5%

Tanged—

Tanged Firmers.....40%
Buck Bros.....30%
Charles Buck Edge Tool Co.....30%
C. E. Jennings & Co. Nos. 191, 181..25%
L. & I. J. White Co.....25&5%

Cold—

	lb.
Cold Chisels, good quality	*13@15¢*
Cold Chisels, fair quality	*11@12¢*
Cold Chisels, ordinary	*9@10¢*

Chucks—

Almond Drill Chucks.....35%
Almond Turret Six-Tool Chuck.....40%
Beach Pat., each $8.00.....35&5%
Empire.....25%
Blacksmiths' 25%
Jacobs' Drill Chucks.....35%
Pratt's Positive Drive.....25%
Skinner Patent Chucks:
Independent Lathe Chucks.....40%
Universal, Reversible Jaws.....40%
Combination, Reversible Jaws.....40%
Drill Chucks, New Model, 25%; Standard, 40&10%; Skinner Pat., 25%; Positive Drive.....40%
Planer Chucks.....30%
Face Plate Jaws.....40%
Standard Tool Co.:
Improved Drill Chuck.....45%
Union Mfg. Co.:
Combination, Nos. 1, 2, 3, 4, 5, 6, 7, 8 and 17, 40%; No. 21.....35%
Scroll Combination, Nos. 82 and 84.....30%
Geared Scroll, Nos. 33, 34 and 35..30%
Independent Iron, Nos. 18 and 318.35%
Independent Steel, No. 64.....25%
Union Drill, Nos. 000, 00, 100, 101, 102, 103, 104.....35%
Union Czar Drill.....25%
Universal 11, 12, 16, 17, 13, 14, 15..35%
Universal, No. 42.....30%
Iron Face Plate Jaws, Nos. 28, 30, 48 and 50.....35%
Steel Face Plate Jaws, Nos. 70 and 72.....30%
Westcott Patent Chucks:
Lathe Chucks.....50%
Little Giant Auxiliary Drill.....50%
Little Giant Double Grip Drill..50%
Little Giant Drill, Improved.....50%
Oneida Drill.....50%
Scroll Combination Lathe.....50%

Clamps—

Adjustable, Hammers'.....20@20&5%
Carriage Makers', P., S. & W. Co.....40&10@50%
Besly, Parallel.....33⅓&10%
Lineman's, Utica Drop Forge & Tool Co.....40%
Wood Workers, Hammers'.....40&10%
Saw Clamps, see Vises, Saw Filers'.

Cleaners, Drain—

Iwan's Champion, Adjustable.....55%
Iwan's Champion, Stationary.....45%

Sidewalk—

Star Socket, All Steel..℔ doz. $4.05 net
Star Shank, All Steel..℔ doz. $3.24 net
W. & C. Shank, All Steel, ℔ doz., 7½ in., $3.00; 8 in., $3.25.

Cleavers, Butchers'—

Foster Bros.....30%
Fayette R. Plumb.....30%
L. & I. J. White Co.....30%

Clippers, Horse and Sheep—

Chicago Flexible Shaft Company:
1902 Chicago Horse, each..$10.75
20th Century Horse, each..$5.00
Lightning Belt Horse, each.$15.00
Chicago Belt Horse, each.$20.00
Stewart's Enclosed Gear Horse, each.....$8.75
Stewart's Patent Sheep Shearing Machine, each.....$12.75
Stewart Enclosed Gear Shearing Machine, No. 8, each..$9.75

Clips, Axle—

Regular Styles, list July 1, '05.80%

Cloth and Netting, Wire—See *Wire, &c.*

Cocks, Brass—

Hardware list:
Plain Bibbs, Globe, Kerosene, Racking, Liquor, Bottling, &c.....70%
Compression Bibbs.....65&10%

Coffee Mills—
See *Mills, Coffee.*

Collars, Dog—

Nickel Chain, Walter B. Stevens & Son's list.....40%
Leather, Walter B. Stevens & Son's list.....40%

Combs, Curry—

Metal Stamping Co.....40%

Compasses, Dividers, &c.

Ordinary Goods.....70&10@75%
Wm. Schollhorn Co.:
Excelsior Dividers.....55%
Lodi Dividers.....75%

Conductor Pipe,—

L. C. L. to Dealers:
Galvanized

Galv. Steel.	*Charcoal Iron.*	*Copper. 14, 16&20 oz.*
Eastern:		
60&30%	60&2½%	30&10&2½%
Central:		
70%	55&7½%	30&10%
Western and Southern:		
65&10%	55&2½%	30&7½%
So. Western		
62½&7½%	50&5%	30&5%

Terms, 60 days; 2% cash 10 days. Factory shipments generally delivered.
See also Eave Troughs.

Coolers, Water—

Gal. each..	2	3	4	6	8
Labrador	$1.20	$1.50	$1.80	$2.10	$2.70
Gal.	3	4	5	6	8
Iceland, ea.	$1.80	$2.10	$2.40	$3.00	
Gal.	2	3	4	6	8
Galvanized, ea.	$1.85	$2.00	$2.25	$2.90	$3.90
Galvanized, Lined, side handles, Gal.	2	3	4	6	8
Each	$1.95	$2.15	$2.40	$3.30	$4.15

White Enameled, 25%; Agate Lined, 25%

Coopers' Tools—
See *Tools, Coopers'.*

Coppers' Soldering—

Soldering Coppers, 3 lbs. to pair and heavier, 23¢; lighter than 3 lb. to pair.....25¢

Cord—Sash—

Braided, Drab.....lb. 35¢
Braided, White, Com., Nos. 8 to 12, 25¢; No. 7, 25½¢; No. 6, 26½¢.
Cable Laid Italian, lb., No. 18, 36¢
Italian, lb., A, No. 18, 25¢; B, 21¢
Common India.....lb. 10@10½¢
Cotton Sash Cord, Tw'ted. 17@19¢
Patent Russia.....lb...19¢
Cable Laid Russia.....lb...20¢
India Hemp, Br'd'd.....lb...20¢
India Hemp, Twisted..lb. 12@13¢
Patent India, Twisted...lb...16¢
Anniston Cordage Co.: ℔ lb, solid Braided, Nos. 8 to 12, $0.24; No. 7, $0.24½; No. 6, $0.25½; ℔ doz., 50 ft., Oriole, $2.00; 50 ft., Columbia, $0.85; 50 ft., Victors, $1.00; 50 ft., 6-Thread, $1.10; 60 ft., 3-Thread, $0.95; 50 ft., Manila, $1.40; 60 ft., Jute, $0.75.
Pearl Braided, cotton, No. 6, ℔ lb, 25½¢; No. 7, 25¢; Nos. 8 to 12, 24½¢
Eddystone Braided, Nos. 8 to 10, 25¢; 7, 25½¢; 6, 26½¢.
Harmony Cable Laid Italian, Nos. 7 to 10.....℔ lb 23 ¢
Pullman:
Wire Sash Cord.....15%
Sash Cord Attachments, per doz..10¢
Samson, Nos. 8 to 12:
Braided, ℔ lb., Drab Cotton, 55¢; Italian Hemp, 40¢@50¢; Linen, 65¢; White Cotton, 50¢; Spot Cord.....50¢ — 15&10%
Massachusetts, White....℔ lb 40¢
Massachusetts, Drab....℔ lb 45¢
No. 7, 2¢; No. 6, 30¢.
Phoenix, White, Nos. 8 to 12, 27¢;
Silver Lake, per lb.:
A, Drab, 43¢; A, White, 40¢; B, Drab, 40¢; B, White, 35¢; Italian Hemp, 40¢; Linen....57½¢
See also Chain and Ribbon.

Wire, Picture—

List July 10, 1906...85&10&10@—
Hendryx Standard Wire Picture Cord, old list, 85&10%

Cradles—

Grain.....40&12½%

Crayons—

White Round Crayons, Cases, 100 gro., $6.50@$7.50 at factory, but lower prices made by jobbers
Zelnicker's Lumber, ℔ gro. White and Purple, Indelible....$7.50
Blue, Red, Green, Yellow and Terra Cotta, $6.50; Black.....$4.00
Genuine Soapstone, Metal Workers', 5 in. x ¼ in. Round, $2.50; 5 in. x ⅛ in. Square, $1.75; 5 x ½ x 3-16, $2.50; 5 x 1¼ x 3-16.....$3.00

Crooks, Shepherds'—

Fort Madison, per doz., Heavy, $7.00; Light.....$6.50

Crow Bars—See *Bars, Crow.*

Cultivators—

Victor Garden.....50%

Cutlery, Table—

International Silver Company:
No. 12 M'd'm Knives, 1847, ℔ doz. $3.50
Star, Eagle, Rogers & Hamilton and Anchor.....℔ doz. $3.00
Wm. Rogers & Son.....℔ doz. $2.50

Cutters—Glass—

H. H. Mayhew Co.....40%
Red Devil.....50%
Smith & Hemenway Co.....50%
Woodward.....40%

Meat and Food—

American.....30%

Nos.	401	402	403	404	405	406	407
Each	$5	$7	$10	$12	$25	$50	$60

Enterprise:

Nos.	5	10	12	22	32
Each	$2	$3	$2.75	$4.50	$6

25@25&7½%
Dixon's.....℔ doz. 30@30&5%

Nos.	1	2	3	4
	$14.00	$17.00	$19.00	$30.00

Ideal.....40@40&5%
Little Giant.....℔ doz. 40@50%

Nos.	305	310	312	320	322
	$35.00	$48.00	$44.00	$72.00	$68.00

N. E. Food Choppers.....25%
New Triumph No. 605, ℔ doz. $24.00.....40@50%
Russwin Food, No. 1, $24.00; No. 2, $27.00.....45&10&10%
Woodruff's.....℔ doz. 30@30&5%

Nos.	100	150
	$15.00	$18.00

Enterprise Beef Shavers.....25@30%

Slaw and Kraut—

Henry Disston & Sons:
Slaw and Kraut Cutters, Corn Graters, &c.....35%
J. M. Mast Mfg. Co.:
Slaw Cutters, 1 Knife....℔ doz. $3.00
Combined Slaw Cutter and Corn Grater.....℔ doz. $4.00
Tucker & Dorsey Mfg. Co.:
Kraut Cutters.....40%
Slaw Cutters, 1 Knife..℔ gr. $18@$20
Slaw Cutters, 2 Knife..℔ gr. $22@$30

Tobacco—

All Iron, Cheap..doz. $1.25@$1.50
Enterprise.....25@30%
National, ℔ doz., No. 1, $21; No. 2, $18.....40%

Diggers, Post Hole, &c.—

Disston's:
Rapid, ℔ doz., $24.00.....25%
Samson, ℔ doz., $34.00.....25%
Iwan's Imp'ved Post Hole Auger.40&5%
Vaughan Pattern Post Hole Augers, ℔ doz., $6.25
Perfection Post Hole Diggers, ℔ doz.....$8.75
Split Handle Post Hole Diggers, ℔ doz., $7.75
Kohler's, ℔ doz., Universal, $14.00; Little Giant, $12.00; Hercules, $10.00; Invincible, $9.00; Rival, $8.00; Pioneer.....$7.00
Never-Break Post Hole Diggers, ℔ doz., $24.00.....60%

Dividers—See *Compasses.*

Drawers, Money—

Tucker's Pat. Alarm Till No. 1, ℔ doz., $18; No. 2, $15; No. 3, $12; No. 4, $18.

Drawing Knives—
See *Knives, Drawing.*

Dressers, Emery Wheel—

Sterling Emery Wheel Dressers.....35%
Sterling Wheel Dresser Cutters.....35%

Drills and Drill Stocks—

Blacksmiths' Common Drilling Machines.....$1.50@$1.75
Breast, Millers Falls.....15&10%
Breast, P., S. & W.....40%
Goodell Automatic Drills.50&10@60&10%
Johnson's Automatic Drills, Nos. 2 and 3.....16⅔%
Johnson's Drill Points.....16⅔%
Millers Falls Automatic Drills.33⅓&10%
Ratchet, Curtis & Curtis.....25%
Ratchet, Parker's.....40%
Ratchet, Weston's.....40%
Ratchet, Weston's, Style H Improved.....40%
Ratchet, No. 012.....40%
Ratchet, Celebrated.....40%
Ratchet, Whitney's, P., S. & W..50%
Whitney's Hand Drill, No. 1, $10.00; Adjustable, No. 10, $12.00.....33⅓%

Twist Drills—

Bit Stock.....60&10&10@70%
Taper and Straight Shank.... 60&10@60&10&5%

Drivers, Screw—

Screw D'ver Bits, per doz..45@50¢
Balsey's Screw Holder and Driver, ℔ doz., 2¼-in., $6; 4-in., $7.50; 6-in., ℔.....50%
Buck Bros.' Screw Driver Bits.....30%
Champion.....50%
Disston's.....70%
Edson.....60%
Fray's Hol. H'dle Sets, No. 3, $12..50%
Ford's Brace Screw Drivers....40&10%
Gay's Double Action Ratchet.....35%
Goodell's Auto.....65@65&10%
Mayhew's Black Handle.....40%
Mayhew's Monarch.....40%
Millers Falls, Nos. 20 and 21....25&10%
Millers Falls, Nos. 11, 12, 41, 42..15&10%
New England Specialty Co.....30%
Smith & Hemenway Co., Neverturn, 40&5%; Elmora.....50%
H. D. Smith & Co.'s Perfect H'dle.40%
Stanley R. & L. Co.'s:
No. 64, Yarn, Handles, 60&10%; No. 66, 70%; Defiance, 70%; Hurwood, 55%.
Swan's:
Nos. 7565 to 7568, 50%; No. 7540, 40&10%

Eave Trough, Galvanized—

Territory. Galv. Steel.	*L. C. L. Galvanized Charcoal Iron.*	*Copper. 14, 16&20 oz.*
Eastern:		
80%	70&5%	30&10&2½%
Central:		
75&10&7½%	70%	30&10%
Western and Southern:		
70&20&7½%	60&15&2½%	30&7½%
So. Western:		
70&20%	65&2½%	30&5%

Terms,—2% for cash. Factory shipments generally delivered.
See also Conductor Pipe and Elbows.

Elbows and Shoes—

Factory shipments, all territories:
Galv. Steel and Galv. C. I.
Standard Gauge.....60&10%
No. 26.....50%
No. 24.....25%
No. 22.....10%
Copper.....50%

Elbows, Stove Pipe—

Edwards, Standard Blue.....40&10&10%
Edwards, Royal Blue.....40&10&10%
Dover, one piece (R. M. Co.).....40&10%
Perfect Elbows.....40%

Emery, Turkish—

	4 to 46:	5½ to 220: Flour.
Kegs.....lb.	5 ¢	5½ ¢ 5¾ ¢
½ Kegs.....lb.	5¼ ¢	5¾ ¢ 5¾ ¢
¼ Kegs.....lb.	5½ ¢	6 ¢ 4 ¢
10-lb. cans, 10 in case....	6½ ¢	7 ¢ 6 ¢
10-lb. cans, less than 10.....	10 ¢	10 ¢ 8 ¢
Less quantity..	10 ¢	10 ¢ 8 ¢

NOTE.—In lots 1 to 3 tons a discount of 10% is given.

Extractors, Lemon Juice

Fasteners, Blind—See *Squeezers, Lemon.*

Zimmerman's ..... 50&10%
Walling's ..... 40&10%

Cord and Weight—

Ives 33⅓%

Faucets—

Cork Lined ..... 50@50&10%
Metallic Key, Leather Lined .. 60&10@70%
Red Cedar ..... 40&10@50%
Petroleum ..... 70&10@75%
B. & L. B. Co.:
Metal Key ..... 60&10%
Star 60%
West Lock ..... 50&10%
John Sommer's Peerless Tin Key 40%
John Sommer's Boss Tin Key 50%
John Sommer's Victor Mtl. Key ..... 50&10%
John Sommer's Duplex Metal Key 60%
John Sommer's Diamond Lock 40%
John Sommer's I. X. L. Cork Lined 50%
John Sommer's Reliable Cork Lined .. 50&10%
John Sommer's Chicago Cork Lined 60%
John Sommer's O. K. Cork Lined 50%
John Sommer's No Brand, Cedar 50%
John Sommer's Perfection, Cedar 40%
McKenna, Brass:
Burglar Proof, N. P. 25%
Improved, ¾ and ⅞ inch 25%
Self Measuring:
Enterprise, ℔ doz. $34.00 ..... 40&10%
Lane's, ℔ doz. $36.00 ..... 40&10%
National Measuring, ℔ doz. $36. 40&10%

Felloe Plates—

See *Plates, Felloe.*

Files— Domestic—

List Nov. 1, 1899.
Best Brands ..... 70&10@75&10%
Standard Brands ..... 75&10@75&10&10%
Lower Grade ..... 75&10&10@80&10%

Imported—

Stubs' Tapers, Stubs' list, July 24, '97 ..... 33 1-3@40%

Fixtures, Fire Door—

Richards Mfg. Co.:
Universal, No. 103; Special, No. 104 ..... $3.75
Fusible Links, No. 96 ..... 50%
Expansion Bolts, No. 107 ..... 60&10%

Grindstone—

Net Prices:

Inch	*15*	*17*	*19*	*21*
Per doz	*$3.25*	*$.75*	*4.25*	*4.75*

P., S. & W. Co. ..... 30&10%
Reading Hardware Co. 60%
Stowell's Giant Grindstone Hanger.. ℔ doz. $6.00
Stowell's Grindstone Fixtures, Extra Heavy, 40&10%; Light 50%

Fodder Squeezers—

See *Compressors.*

Forks—

NOTE.—Manufacturers are selling from the list of September 1, 1904, but many jobbers are still using list of August 1, 1899, or selling at net prices.

Iowa Dig-Ezy Potato ..... 60&10%
Victor, Hay ..... 60&15&2½%
Victor, Manure 66⅔%
Victor, Header 60%
Champion, Hay 66⅔%
Champion, Header 66⅔%
Champion, Manure ..... 60&15&2½%
Columbia, Hay ..... 60&20%
Columbia, Manure 70%
Columbia, Spading ..... 70&12½%
Hawkeye Wood Barley 40%
W. & C. Potato Digger ..... 60&10%
Acme Hay ..... 60&20%
Acme Manure, 4 tine ..... 60&10&5%
Dakota Header ..... 60&20%
Jackson Steel Barley ..... 60&20%
Kansas Meader 65%
W. & C. Favorite Wood Barley 40%
Plated.—See Spoons.

Frames— Saw—

White, S'g't Bar, per doz. ..... 75@80¢
Red, S'g't Bar, per doz. ..... $1.00@1.25
Red, Dbl. Brace, per doz. ..... $1.40@1.50

Freezers, Ice Cream—

Qt.	*1*	*2*	*3*	*4*	*6*
Each	*$1.30*	*$1.60*	*$1.90*	*$2.20*	*$2.80*

Fruit and Jelly Presses—

See *Presses, Fruit and Jelly.*

Fry Pans—See *Pans, Fry.*

Fuse— *Per 1000 Feet.*

Hemp $2.75
Cotton 3.20
Waterproof Sgl. Taped .. 3.65
Waterproof Dbl. Taped .. 4.40
Waterproof Tpl. Taped .. 5.15
} 2½% 10%

Gates, Molasses and Oil—

Stebbins' Pattern ..... 80&10%

Gauges—

Marking, Mortise, &c. ..... 50@50&10%
Chapin-Stephens Co.:
Marking, Mortise, &c. ..... 50&50&10%
Scholl's Patent ..... 50&10@50&10&10%
Door Hangers ..... 50@50&10%
Disston's Marking, Mortise, &c. 66⅔%
Stanley R. & L. Co.'s Butt and Rabbet Gauge 38%
Marking and Mortise 55%
Wire, Brown & Sharpe's 33⅓%
Wire, Morse's 25%
Wire, P., S. & W. Co. 30%

Gimlets— Single Cut—

Numbered assortments, per gro.

Nail, Metal, No. 1, $2.00; 2, $2.30
Spike, Metal, No. 1, $4.00; 2, $4.30
Nail, Wood Handled, No. 1, $2.50; 2, $2.60
Spike, Wood Handled, No. 1, $4.30; 2, $4.60

Glass, American Window

See *Trade Report.*

Glasses, Level—

Chapin-Stephens Co. ..... 60@60&10%

Glue, Liquid Fish—

Bottles or Cans, with Brush .. 25&10@50%
International Glue Co. (Martin's) .. 40%

Grease, Axle—

Common Grade .... *gro. $4.50@6.00*
Dixon's Everlasting, 10-lb pails, ea. 85¢; in boxes, ℔ doz., 1 lb, $1.20; 2 lb $2.00
Helmet Hard Oil 25%

Griddles, Soapstone—

Pike Mfg. Co. ..... 33⅓@33⅓&10%

Grindstones—

Pike Mfg. Co.:
Improved Family Grindstones, ℔ inch, ℔ doz., $2.00 ..... 33⅓%
Royal Mfg. Co.:
Alundum Grinding Machines, each, Nos. 01, $1.75; 1A, $2.50; 10, $5.00 ..... 30%
Alundum Sickle Grinders, each, Nos. 20A, $6.00; 20A Combined, $6.50 ..... 30%
Alundum Disc Grinders, each, $2.50 ..... 30%

Grips, Nipple—

Perfect Nipple Grips ..... 40&10&2%

Halters and Ties—

Cow Ties ..... 60&10@60&10&5%
Covert Mfg. Co.:
Web ..... 30&2%
Jute Rope 35%
Sisal Rope 30%
Cotton Rope 45%
Hemp Rope 45%
Oneida Community:
Am. Coil and Halters ..... 40@40&5%
Am. Cow Ties ..... 45@50%
Niagara Coil and Halters .. 45@50&5%
Niagara Cow Ties .... 45&5@50&10&5%

Hammers—

Handled Hammers—

Heller's Machinists' .. 55&10@55&10&5%
Heller's Farriers' ..... 40&5@40&10&5%
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50, $1.75 ..... 50%
Peck, Stow & Wilcox, Steel 50%
Fayette R. Plumb:
Plumb, A. E. Nail ..... 40&2½%@40&12½%
Engineers' and B. S. Hand ..... 50&12½%@60%
Machinists' Hammers .. 50&15@60&5%
Riveting and Tinners' ..... 40&2½%@40&12½%

Heavy Hammers and Sledges—

Under 3 lb., per lb., 50¢ .. 80&5@ .. %
3 to 5 lb., per lb., 40¢ .. 80&5@ .. %
Over 5 lb., per lb., 30¢ .... 80&10&5@ .. %
Wilkinson's Smiths' ... lb. 9½@10¢

Handles—

Agricultural Tool Handles

Axe, Pick, &c. .... 60&10@60&10&5%
Hoe, Rake, &c. ..... 40@45&5%
Fork, Shovel, Spade, &c.:
Long Handles ..... 40@45&5%
D Handles 40%

Cross-Cut Saw Handles—

Atkins' 40%
Champion 50%
Disston's 50%

Mechanics' Tool Handles—

Auger, assorted ... *gro. $2.50@3.00*
Brad Awl ..... *gro. $1.65@1.75*
Chisel Handles, Ass'd, per gro.:
Tanged Firmer, Apple, $2.40@ $2.65; Hickory ..... *$2.15@2.40*
Socket Firming, Apple, $1.75@ $1.95; Hickory ..... *$1.45@1.60*
Socket Framing, Hickory, $1.60@$1.75
File, assorted ..... *gro. $1.30@$1.40*
Hammer, Hatchet, &c. 60&10@60&10&5%
Hand Saw, Varnished, doz. 80&85¢; Not Varnished ... *65@75¢*
Plane Handles:
Jack, doz. 30¢; Jack, Bolted 75¢
Fore, doz. 45¢; Fore, Bolted 90¢
Chapin-Stephens Co.:
Carving Tool ..... 40@40&10%
Chisel ..... 65@65&10%
File and Awl ..... 65@65&10%
Saw and Plane ..... 40@40&10%
Screw Driver ..... 40@40&10%
Millers Falls Adj. and Ratchet Auger Handles ..... 20&10%
Nicholson Simplicity File Handle .. ℔ gro. $0.85@$1.80

Hangers—

NOTE.—Barn Door Hangers are generally quoted per pair, without track, and Parlor Door Hangers per double set with track, &c.

Allith Mfg. Co.:
Reliable, No. 1; Allith, No. 3; Allith Adjustable, No. 6; Reliable Parlor Door 50%
Chicago Spring Butt Co.:
Friction 25%
Oscillating 25%
Big Twin 25%
Chisholm & Moore Mfg. Co.:
Baggage Car Door 50%
Elevator 30%
Railroad 50%
Cronk & Carrier Mfg. Co.:
Loose Axle ..... 60&10%
Roller Bearing 70%
Griffin Mfg. Co.:
Solid Axle, No. 10, $12.00 ..... 70%
Roller Bearing, No. 11, $15.00 .. 70%
Roller Bearing, Ex. Hy., No. 22, $18.00 ..... 70%
Hinged Hangers, $16.00 .... 60&10%
Lane Bros. Co.:
Parlor, Ball Bearing, $4.00; Standard, $3.15; No. 105, $2.85; New Model, $2.80; New Champion $2.25
Barn Door, Standard .... 60&5%
Hinged ..... net $6.08
Covered ..... 60&2%
Special ..... 70&5%
Lawrence Bros.:
Advance and Sterling .... 60&2½%
Cleveland and Peerless .. 70&7½%
Clipper, No. 75 ..... 60&5%
Crown ..... 60&2½%
Cyclone-Tandem .. .. net $7.50
Easy Parlor Door, Dbl. Sets, $2.50; Single Sets, $1.25. Giant 60%
Hummer ..... 70&7½%
New Cyclone, Flexible, $16.00 60%
New York ..... 60&2½%
McKinney Mfg. Co.:
No. 1, Special, $15 ..... 60&10%
No. 2, Standard, $18 ..... 60&10%
Hinged Hangers, $16 ..... 50%
Meyers' Stayon Hangers ..... 60&5%
Richards Mfg. Co.:
Hangers, Nos. 47, 48, 147, 247, 70&7½% 60&5%
Pioneer Wood Track, No. 3 .. $2.25
Roller B'r'g St'l Track No. 12. $2.20
Roller B'r'g St'l Track No. 13. $2.50
Roller B'r'g, Nos. 30, 41, 43, 70&7½%
Hero, Adj. Track No. 19 .. 50&10%
Adjustable Track Tandem Trolley Track No. 16 ..... 50&10%
Seal, Steel Track No. 8 .... $2.25
Auto Adj. Track No. 22 .. 50&5%
Trolley B. D. No. 17, $1.25; F. D. No. 120, $2.25; No. 121, $2.45; No. 150 ..... $2.50
Safety Underwriters F. D. No. 101 ..... 50%
Tandem No. 41..2½ and 3 60&10%
Palace, Adjustable Track No. 132 ..... 50&5%
Royal, Adjustable Track No. 122 ..... 50&10%
Ives' Wood Track No. 1 .... $2.25
Trolley B. D. No. 29 ..... 50&10%
Trolley B. D. No. 24, $1.30; No. 27, $1.40; No. 28 ..... $1.60
Roller Bearings, Nos. 37, 38, 39, 41, 43, 44, Sizes 1 and 2.70&7½%
Anti-friction, No. 42; No. 44, sizes 2½ and 3 ..... 60%
Hinged Tandem No. 48 .... 60&5%
Folding Door B. B. Swivel No. 135 ..... 40%
Stowell Mfg. & Foundry Co.:
Acme Parlor Ball Bearing 30%
Ajax Hinge Door 60%
Apex Parlor Door ..... 50&10&5%
Atlas 60%
Baggage Car Door 50%
Climax Anti-Friction 50%
Elevator 40%
Express 50%
Lundy Parlor Door 50%
Matchless 60%
Nansen 70%
Parlor Door, 50&10%; Railroad, 50&10%
Steel, Nos. 300, 404, 500 ..... 50%
Underwriters' Fire Door 40%
Wild West Warehouse Door .. 50%
Wilbern, No. 0, net, ℔ doz. .. $9.00
Zenith for Wood Track 50%
A. L. Sweet Iron Works:
Check Back, 70%; Eagle 70%
Climax Anti-Friction ..... 50&10%
Hylo Hinge, New Perfection, Pilot, Pilot Hinge 60%
Rider Wooster 65%
Western Pattern 70%
Taylor & Boggis F'y Co.'s Kidder's Roller Bearing. 50&15&10&5%

Hangers— Garment—

Pullman Trouser, ℔ gro., 1 pair Flat Aluminoy, $9.00; 1 pair Round Nickeled, $9.00; 1 pair Round Nickeled, $27.00; 1 pair Flat Gun Metal, $12.00; 1 pair Flat Black Enameled, $7.50; 1 pair Wood Clamp, $13.50; Skirt Hangers, Folding, per gro., $21.00; Coat Hangers, Folding, per gro., $8.00; Garment Hanger Rods, Round Nickeled, per gro., $10.50; Garment Hanger Loops, Round Nickeled, per gro. $10.50
Victor Folding ..... ℔ gro. $9.00
Western, W. G. Co. ..... 75&10%

Gate—

Myers' Patent Gate Hangers, ℔ doz. net $4.50

Joist and Timber—

Lane Bros. Co. 30%

Hasps—

Griffin's Security Hasp ..... 50&10%
McKinney's Perfect Hasp, ℔ doz. .. 50%

Hatchets—

Regular list, first quality 50%
Second quality $1.00 per doz. less than first quality.

Heaters, Carriage—

Clark, No. 5, $1.75; No. 5B, $2.00; No. 3, $2.25; No. 3D, $2.75; No. 7D, $3.00; No. 3E, $3.25; No. 1, $3.50 ..... 25%
Clark Coal, ℔ doz., $0.75 ..... 20%

Extra 10% often given.

Hinges—

Blind and Shutter Hinges—

Surface Gravity Locking Blind: (Victor; National; 1868 O. P.; Niagara; Clark's O. P.; Clark's Tip; Buffalo.)

No.	*1*	*3*	*5*
Doz. pair	*$0.75*	*1.35*	*2.70*

Mortise Shutter: (L. & P., O. S., Dixie, &c.)

No.	*1*	*1½*	*2*	*2½*
Doz. pair	*$0.70*	*.65*	*.60*	*.55*

Mortise Reversible Shutter (Buffalo, &c.):

No.	*1*	*1½*	*2*
Doz. pair	*$0.70*	*.65*	*.60*

North's Automatic Blind Fixtures, No. 2, for Wood, $9.00; No. 3, for Brick, $11.50 ..... 10%
Charles Parker Co. ..... 70@75%
Parker Wire Goods Co.:
Hale & Benjamin Automatic Blind Hinges 20%
Hale's Blind Awning Hinges, No. 110, for wood, $9.00; No. 111, for brick, $9.00 ..... 20%
Reading's Gravity 60%
Stanley's Steel Gravity Blind Hinges, No. 1647½, ℔ doz. sets, without screws, $0.95; with screws, $1.25.
Wrightsville Hardware Co.:
O. S., Lull & Porter ..... 75&10&5%
Acme, Lull & Porter ..... 75&10%
Queen City Reversible ..... 75&10%
Shepard's Noiseless, Nos. 60, 65, 55 ..... 75&10%
Niagara, Gravity Locking, Nos. 1, 3 & 5 ..... 75&10&5%
1868, Old Pat'n, Nos. 1, 3 & 5 ..... 75&10&5%
Tip Pat'n, Nos. 1, 3 & 5 ..... 75&10&5%
Buffalo Gravity Locking, Nos. 1, 3 & 5 ..... 75&10&5%
Shepard's Double Locking, Nos. 20 & 25 ..... 70%
Champion Gravity Locking, No. 75 .. 75%
Steamboat Gravity Locking, No. 10. 75%
Pioneer, Nos. 060, 45 & 5½ 75%
Empire, Nos. 101 & 103 ..... 70%
W. H. Co.'s Mortise Gravity Locking, No. 2 ..... 60%

Gate Hinges—

Clark's or Shepard's—Doz. sets:

No.	*1*	*2*	*3*
Hinges with L't'chs.	*$2.00*	*2.70*	*5.00*
Hinges only	*1.40*	*2.05*	*3.80*
Latches only	*.70*	*.70*	*.35*

New England:
With Latch ..... doz. ... @$2.00
Without Latch .. doz. ... @$1.60
Reversible Self-Closing:
With Latch ..... doz. ... @$1.75
Without Latch .. doz. ... @$1.35
Western:
With Latch ..... doz. $1.75
Without Latch ..... doz. $1.15
Wrightsville Hardware Co.:
Shepard's or Clark's, doz. sets.

	Nos. 1	2	3
Hinges with Latches	$2.00	2.70	5.00
Hinges only	1.40	2.05	3.80
Latches only	.70	.70	1.35

Pivot Hinges

Bommer Bros. Pivot 40%
Lawson Mfg. Co. Matchless 50%

Spring Hinges—

Holdback, Cast Iron ... *$6.50@$7.00*
Non-Holdback, Cast Iron *$6.25@$6.75*
J. Bardsley:
Bardsley's Non-Checking Mortise Floor Hinges 40%
Bardsley's Patent Checking .. 33⅓%
Bommer Bros.:
Bommer Ball Bearing Floor .. 40%
Bommer Spring Hinges 40%
No. 999 Wrot. Steel Hold Back, ℔ gr. $9.00
Chicago Spring Butt Co.:
Chicago Spring Hinges 25%
Triple End Spring Hinges 50%
Chicago (Ball Bearing) Floor .. 50%
Garden City Engine House 25%
Keene's Saloon Door 25%
Columbian Hardware Co.:
Acme, Wrought Steel 30%
Acme, Brass 25%
American 30%
Columbia, ℔ gr., No. 14, $9.00; No. 18, $25.00
Columbia, Adj., No. 7, ℔ gr. $12.00
Columbian Hinges ..... 60&10%
Gem, new list 30%
Clover Leaf ..... ℔ gr. $12.00
Oxford, new list 30%
Floor Spring Hinges ..... 65&10%
Lawson Mfg. Co., Matchless 30%
Richards Mfg. Co.:
Superior Double Acting Floor Hinges 40%
Shelby Spring Hinge Co.:
Buckeye All Steel Holdback Screen Door ..... ℔ gr. $9.00
Chief Ball Bearing Floor Hinge 50%
Ball Bearing Door 25%
No. 777, Sheet Steel Holdb'k. ℔ gr. pr. $9.00
Superior Spring Hinge Co.:
Superior Floor Hinges 33⅓%
The Stover Mfg. Co.:
Ideal, No. 16, Detachable, ℔ gr. $12.50
Ideal, No. 4 ..... ℔ gr. $8.00
New Idea No. 1 ..... ℔ gr. $9.00
New Idea, Double Acting 50%
New Idea Floor 50%

Extra 10% often given on most of these Hinges.

Wrought Iron Hinges—

Strap and T Hinges, &c., list December 20, 1904:
Light Strap Hinges .. 65%
Heavy Strap Hinges .. 70%
Light T Hinges 60%
Heavy T Hinges 50%
Extra H'y T Hinges .. 66⅔%
Hinge Hasps 45%
Cor. Heavy Strap 70%
Cor. Ex. Heavy T .. 66⅔%
Screw Hook and Strap. { *6 to 12 in.* .. *lb. 3½¢* / *15 to 20 in.* .. *lb. 3½¢* / *22 to 36 in.* .. *lb. 3½¢* } Extra 10&10%

Screw Hook and Eye:
¾ to 1 inch.....lb. 6½¢
⅝-inch.....lb. 7½¢
½-inch.....lb. 8½¢

Hitchers, Stall—
Covert Mfg. Co., Stall Hitchers..30&2%

Hods— Coal—

	Per doz.			
Inch	15	16	17	18
Galv. Open	$2.50	$2.75	3.00	3.25
Jap. Open	$1.90	2.10	2.25	2.55
Galv. Funnel	$3.00	3.30	3.60	3.90
Jap. Funnel	$2.45	2.65	2.85	3.30

Masons' Etc.—
Cleveland Wire Spring Co.:
Steel Brick, No. 162.....each $1.05
Steel Mortar, No. 158.....each $1.35

Hoes— Eye—
Scovil and Oval Pattern.....
60&10@60&10&10%
Grub, list Feb. 23, 1899.....
70&10@75&10%
D. & H. Scovil.....30%

Handled—
NOTE.—Manufacturers are selling from the list of September 1, 1904, but many jobbers are still using list of August 1, 1899, or selling at net prices.
Cronk's Weeding, No. 1, $2.75; No. 2, $2.50
Star Double Bit.....$3.20
Ft. Madison Cotton Hoe....10&10&10%
Ft. Madison Crescent Cultivator Hoe, ℔ doz.....70&10%
Ft. Madison Mattock Hoes:
Regular Weight.....℔ doz. 66⅔%
Junior Size.....℔ doz. $4.00
Ft. Madison Sprouting Hoe..℔ doz. 50%
Ft. Madison Dixie Tobacco Hoe.....
75&10&7½%
Kretsinger's Cut Easy.....70&10%
Warren Hoe.....45&10%
W. & C. Ivanhoe.....75&2%
B. B. 6 in., Cultivator Hoe.....$3.15
B. B., 6½ in.....$3.35
Acme Wedding.....℔ doz., net, $4.35
W. & C. L'tning Shuffle Hoe, ℔ doz. $4.85

Hoisting Apparatus—
See *Machines, Hoisting.*

Holders— Bit—
Angular, ℔ doz. $24.00.....45&10%

Door—
Bardsley's, Iron, 40%; Brass and Bronze.....33⅓%
Empire.....50%
Pullman.....35%
Superior.....33⅓%

File and Tool—
Nicholson File Holders and File Handles.....33⅓@40%

Fruit Jar—
Triumph Fruit Jar Holder, ℔ gross, $10.80; ℔ doz.....$1.25

Trace and Rein—
Fernald Double Trace Holder, ℔ doz. pairs.....$1.25
Dash Rein Holder, ℔ doz. pairs..$1.25

Hones—Razor—
Pike Mfg. Co., Belgian, German and Swaty.....60%

Hooks—Cast Iron—
Bird Cage, Reading.....40%
Clothes Line, Reading List.....40%
Clothes Line, Stowell's.....70%
Coat and Hat, Reading.....45&20%
Coat and Hat, Stowell's.....70%
Coat and Hat, Wrightsville.....65%
Harness, Reading List.....40%
Harness, Stowell's.....60%
School House, Stowell's.....70%

Wire—
Belt.....80&10@..%
Wire C. & H. Hooks:.....
75&10@75&10&10%
Columbian Hdw Co., Gem.....70&10%
Parker Wire Goods Co., King..70&10%
Western W. G. Co. Molding.....75%
Wire Goods Co.:
Acme, 60&10%; Chief, 70%; Crown, 75%; Czar, 65%; V Brace, 75%; Czar Harness, 50&10%.

Wrought Iron—
Box, 6 in., per doz., $1.00; 8 in., $1.25; 10 in., $3.50.
Cotton.....doz. $1.05@$1.25
Wrought Staples, Hooks, &c.—
See Wrought Goods

Miscellaneous—
Hooks, Bench, see Stops, Bench.
Bush, Light, doz. $4.75; Medium, $5.35; Heavy, $6.25
Grass, best, all sizes, per doz.$1.60
Grass, common grades, all sizes, per doz.....$1.30
Whiffletree.....lb. 5¾@6¢
Hooks and Eyes:
Brass.....60&5@60&10&5%
Malleable Iron.....70@70&10%
Covert Mfg. Co. Gate and Scuttle Hooks.....40%
Ft. Madison Cut-Easy Corn Hooks, ℔ doz. $3.25 net
Bench Hooks—See Bench Stops.
Corn Hooks—See Knives, Corn.

Horse Nails—
See *Nails, Horse.*

Horseshoes—
See *Shoes, Horses.*

Hose, Rubber—
Garden Hose, ¾-inch:
Competition.....*ft. 5 @ 6 ¢*
3-ply Guaranteed..*ft. 8 @ 9 ¢*
4-ply Guaranteed..*ft. 10 @11 ¢*
Cotton Garden, ¾-in., coupled:
Low Grade.....*ft. 8 @ 9 ¢*
Fair Quality.....*ft. 10 @11 ¢*

Irons— Sad—
From 1 to 10.....lb. 3 @3½¢
R. B. Sad Irons.....lb. 3½@3½¢
Mrs. Potts', cents per set:

	Nos. 50	55	60	65
Jap'd Tops	65	62	75	72
Tin'd Tops	70	67	80	77

New England Pressing.lb. 5¾@6¢

Pinking—
Pinking Irons.....doz. 60¢

Irons, Soldering
See *Coppers.*

Jacks, Wagon—
Covert Mfg. Co.:
Auto Screw.....30&2%; Steel, 45%
Lockport.....50%
Lane's Steel.....30&10&2%
Richards' Tiger Steel, No. 130...50&10%
Smith & Hemenway Co.'s.....55%

Kettles—
Brass, Spun, Plain.....20@25%
Enameled and Cast Iron—See Ware, Hollow.

Knives—
Butcher, Kitchen, &c.—
Foster Bros.' Butcher, &c.....30%
Wilkinson Shear & Cutlery Co.....60%

Corn—
Wilkinson Shear & Cutlery Co., Wilcut Brand Knives and Hooks.60%
Withington Acme, ℔ doz., $2.65; Dent, $2.75; Adj. Serrated, $2.20; Serrated, $2.10; Yankee No. 1, $1.50; Yankee No. 2, $1.15.

Drawing—
Standard List.....75&5@75&10%
C. E. Jennings & Co., Nos. 45, 46..60%
Jennings & Griffin, Nos. 41, 42....75%
Swan's.....70%
Watrous.....16⅔%
L. & I. J. White.....20&5@25%

Hay and Straw—
Serrated Edge, per doz. $5.75@6.00
Iwan's Sickle Edge.....℔ doz. $9.50
Iwan's Serrated.....℔ doz. $10.00

Mincing—
Buffalo.....℔ gro. $13.00

Miscellaneous—
Farriers'.....*doz. $3.00@3.25*
Wostenholm's.....℔ doz. $3.00@3.25

Knobs—
Base, 2½-inch, Birch, or Maple, Rubber Tip.....*gro. $1.25@$1.40*
Carriage, Jap., all sizes.....
gro. 40@45¢
Door, Mineral.....*doz. 65@70¢*
Door, Por. Jap'd.....*doz. 70@75¢*
Door, Por. Nickel..*doz. $2.05@2.15*
Bardsley's Wood Door, Shutters, &c.15%

Lacing, Leather—
See *Belting, Leather—*

Ladders, Store, &c.—
Allith Mfg. Co., Reliable.....50%
Lane's Store.....25%
Myers' Noiseless Store Ladders....50%
Richards Mfg. Co.:
Improved Noiseless, No. 112.....50%
Climax Shelf, No. 113.....50%
Trolley, No. 109.....50%

Ladles, Melting—
L. & G. Mfg. Co. (low list).....25%
P. S. & W.....40&10%
Reading.....50%

Lanterns—Tubular—
Regular Tubular, No. 0.....
doz. $4.25@4.50
Lift Tubular, No. 0.....
doz. $4.75@5.00
Hinge Tubular, No. 0.....
doz. $4.75@5.00
Other Styles.....*40@40&5%*

Bull's Eye Police—
No. 1, 2¾-inch.....*$2.75@3.00*
No. 2, 3-inch.....*$3.00@3.25*

Lasts and Stands, Shoe—
Stowell's Atlas, Malleable Iron.....50%
Stowell's Badger, Cast Iron.....50%

Latches— Thumb—
Roggin's Latches, with screw..
doz. 35@40¢

Door—
Allith Mfg. Co., Automatic, No. 400 ℔ doz.....$4.00
Cronk & Carrier Mfg. Co., No. 101, ℔ doz. $2.90
Cronk & Carrier Mfg. Co., Latch, Hasp and Staples.....50%
Richards' Bull Dog, Heavy, No. 125.....50&5%
Richards' Trump, No. 127.....$1.50
Stowell's Steel.....50%

Leaders, Cattle—
Small.....*doz. 50¢; large, 60¢*
Covert Mfg. Co.:
Cotton, 45%; Hemp, 45%; Jute, 35%; Sisal, 20%.

Lifters, Transom—
R. & E.....10%

Lines—

Wire Clothes, Nos.	*18*	*19*	*20*
100 feet	$2.25	2.00	1.75
75 feet	$1.75	1.55	1.10

Anniston Waterproof Clothes, 50 ft., ℔ gro., $25.00; Gilt Edge, $23.00; Air Line, $23.00; Acme, $18.00; Alabama, $17.00; Empire, $16.00; Advance, $14.00; Eclipse, $13.50; Chicago, $11.50; Standard, $10.50; Columbia, $9.50; Allston, $13.50; Calhoun, $12.00.
Samson Cordage Works:
Solid Braided Chalk, Nos. 0 to 3..40%
Solid Braided Masons'.....35%
Silver Lake Braided Chalk, No. 0, $6.00; No. 1, $6.50; No. 2, $7.00; No. 3, $7.50.....℔ gr. 20%
Masons' Lines, Shade Cord, &c.:
White Cotton, No. 3½, $1.50; No. 4, $2.00; No. 4½, $2.50; Colors, No. 3½, $1.75; No. 4, $2.25; No. 4½, $2.75; Linen, No. 3½, $2.50; No. 4, $3.50; No. 4½, $4.50.....20%
Tent and Awning Lines: No. 5, White Cotton, $7.50; Drab Cotton, $8.50.....20%
Clothes Lines, White Cotton: 50 ft., $2.75; 60 ft., $3.25; 70 ft., $3.75; 75 ft., $4.00; 80 ft., $4.25; 90 ft., $4.75; 100 ft., $5.25.....20%

Locks— Cabinet—
Cabinet Locks...33⅓@33⅓&7½%
Door Locks, Latches, &c.—
NOTE.—Net Prices are very often made on these goods.
Reading Hardware Co.....40%
R. & E. Mfg. Co.....10%

Elevator—
Stowell's.....50%

Padlocks—
Wrought Iron.....75@75&10%
Net prices are general.
R. & E. Mfg. Co. Wrought Steel and Brass.....75&10%

Sash, &c.—
Ives' Patent:
Bronze and Brass, 60%; Crescent, 40&20%; Iron, 60%; Window Ventilating, 55%; Robinson Pat. Ventilating Sash Lock, 33⅓%; Wrought Bronze and Brass, 55%; Wrought Steel, 55%.
Pullman Patent Ventilating Lock..35%
Reading.....40%

Machines—Boring—
Com. Upr't, without Augers,
$2.00@2.25
Com. Angl'r, without Augers,
$2.25@2.50
Swan's Improved.....40&10%
Jennings', Nos. 1 and 4.....33⅓%
Millers' Falls.....5.75
Snell's, Upright, $2.65; Angular, $2.90

Corking—
Reisinger Invincible Hand Power.....
℔ doz. $18.00

Fence—
Williams' Fence Machines....each, $5.50

Hoisting—
Moore's Anti-Friction Differential Pulley Block.....30%
Moore's Hand Hoist, with Lock Brake.....20%
Moore's Cyclone High Speed Chain Hoist.....25%

Ice Cutting—
Chandler's.....12½%

Washing

Boss Washing Machine Co.:	Per doz.
Boss No. 1	$57.00
Boss Rotary	$57.00
Champion Rotary Banner No. 1	$57.00
Standard Champion No. 1	$50.00
Standard Perfection	$27.00
Cincinnati Square Western	$33.00
Uneeda American, Round	$33.60

Mallets—
Hickory.....45&5@50%
Lignumvitæ.....45&5@50%
Tinners' Hickory and Applewood.....*doz. 45&5@50%*

Mangers, Stable—
Swett Iron Works.....50%

Mashers, Vegetable—
Western, W. G. Co., Potato....60&10%

Mats, Door—
Elastic Steel (W. G. Co.), new list.50%
Keystone Wire Matting Co.:
Keystone.....50%
Ideal.....50%

Mattocks—
See *Picks and Mattocks.*

Milk Cans—See *Cans, Milk.*

Mills, Coffee, &c.—
Enterprise Mfg. Co.....20@25%
National list Jan. 1, 1902.....30%
Parker's Columbia & Victoria.50&10@60%
Parker's Box and Side.....50&10@60%
Swift, Lane Bros. Co.....30%

Motors Water—
Divine's Red Devil.....30%

Mowers, Lawn—
NOTE.—Net prices are generally quoted
Cheapest.....*all sizes, $1.85@2.00*
Cheap.....*all sizes, $2.00@2.50*
Better Grade..*all sizes, $2.50@4.50*

	12	14	16	18-in.
High Grade	$4.50	4.75	5.00	5.25

Continental.....60&5%
Great American.....70%
Great American Ball B'r'g, new list.70%
Quaker City.....70%
Pennsylvania.....60&5%
Pennsylvania, Jr., Ball Bearing....60%
Pennsylvania Golf.....50%
Pennsylvania Horse.....33⅓&5%
Pennsylvania Pony.....40&5%
Granite State:
Style A, Low Wheel.....70&10&10%
Style B, Low Wheel.....70&10%
Style C, High Wheel.....70&10%
Style D, High Wheel.....70%
Philadelphia:
Styles M., S., C., K., T....70&10&5%
Style A, all Steel.....60&10&5%
Style E, High Wheel.....70&10&5%
Drexel and Gold Coin, special list.40%

Nails—
Wire Nails and Brads, Miscellaneous.....*85&10@85&10&5%*
Cut and Wire. See *Trade Report.*
Hungarian, Finishing, Upholsterers' &c. See *Tacks.*

Horse—

Nos.	6	7	8	9	10	
Anchor	23	21	20	19	18	...40&5%
Champlain	28	26	25	24	23	.....50%
Coleman	13	12	12	11	11	.....net
New Haven	23	21	20	19	18	...40&5%
Livingston	19	18	17	16	16	.....10%

Western.....℔ lb 8½¢
Jobbers' Special Brands.....
per lb. 9@10¢

Picture—

	1½	2	2½	3	in.
Brass H'd	.45	.55	.60	.70	.. gro
Por. Head	..	1.10	1.10	1.10	.. gro

Nippers—
See *Pliers and Nippers.*

Nuts—
Cold Punched: *Off list.*
Square, Blank or Tapped..*4.80¢*
Hexagon, Blank or Tapped..*5.10¢*
Square, Bl'k, C., T. & R...*5.10¢*
Hexagon, Bl'k, C., T. & R.5.70¢
Hot Pressed:
Square, Blank.....*5.00¢*
Hexagon, Blank.....*5.40¢*
Square, Tapped.....*4.70¢*
Hexagon, Tapped.....*5.10¢*

Oakum—
Best.....lb., 6½¢
U. S. Navy.....lb., 6¢
Navy.....lb., 5¢
Plumbers' Spun Oakum.....8¾¢
In carload lots ½¢ lb. off, f.o.b. New York.

Oil Tanks—See *Tanks, Oil.*

Oilers—
Brass and Copper.....50&10%
Tin or Steel.....65&10&5@70%
Zinc.....65&10&5@70%
Chase or Paragon:
Brass and Copper.....50&10%
Tin or Steel.....65&10%
Zinc.....65&10%
Malleable, Hammers' Improved, Nos. 11, 12 and 13, 20%; Old Pattern, Nos. 1, 2, 3, 50%.
American Tube & Stamping Co.:
Spring Bottom Cans.....70@70&10%
Railroad Oilers, &c.....60@60&10%

Openers— Can— *Per doz.*
Sprague, Iron Handle....*30@35¢*
Sprague, Wood Handle...*35@40¢*
Sardine Scissors.....*$1.75@$3.00*
Vim Tin Shear and Can Opener, ℔ doz., 75c.; per gro., $7.50
Yankee Can and Bottle Opener, ℔ doz., net.....$0.75

Egg—
Nickel Plate, ℔ doz., $2.00; Silver Plate, $4.00.

Packing—
Asbestos Packing, Wick and Rope.....*17@22¢*

Rubber—
(*Fair quality goods.*)
Sheet, C. I......*11@12¢*
Sheet, C. O. S......*11@12¢*
Sheet, C. B. S......*12@13¢*
Sheet, Pure Gum.....*40@45¢*
Sheet, Red.....*40@50¢*
Jenkins' '96, ℔ lb, 80¢.....25%

Miscellaneous—
American Packing...lb. 7@10 ¢
Cotton Packing.....lb. 16@25 ¢
Italian Packing.....lb. 9@12½¢
Jute.....lb. 4@ 4½¢
Russia Packing.....lb. 8@11 ¢

Pails, Creamery—
R. M. Co., with gauges, ℔ doz., No. 1, $6.25; No. 2, $6.50.

Pails, Water, Well, &c.—
See *Buckets.*

Pans— Dripping—
Standard List.....*65&7½%*

Fry—
Common Lipped:

	Nos.	1	2	3	4	5
Per doz.		$0.75	0.80	0.90	1.10	1.30

Refrigerator, Galva.—

Inch	12	14	16	18
Per doz	$1.75	2.25	2.80	3.15

Roasting and Baking—
Regal, R. M. Co., ℔ doz., Nos. 5, $4.50; 10, $5.25; 20, $5.75; 30, $6.25.
Savory, ℔ doz., net, Nos. 200, $9.00; 400, $15.00.
Simplex, ℔ gro.:

No.	40	50	60	140	150	160
	$30.00	35.00	42.00	34.00	39.00	46.00

Paper—Building Paper

Asbestos:	lb.
Roll Board or Building Felt, 6 to 30 lb., per 100 sq. ft.	3½@5¢
Roll Board or Building Felt, 3-32 and ⅛ in., 45 to 60 lb., per 100 sq. ft.	6¢
Mill Board, Sheet, 40 x 40 in., 1-32 to ½ in.	30@5¢
	Per roll
Rosin Sized Sheathing: 500 sq. ft. Light weight, 25 lbs. to roll	*40@50¢*
Medium weight, 30 lbs. to roll.	*50@55¢*
Heavy weight, 40 lbs. to roll..	*65@70¢*
Black Water Proof Sheathing, 500 sq. ft., 1 ply, 65¢; 2 ply, 85¢; 3 ply, $1.10; 4 ply, $1.25.	
Deafening Felt, 9, 6 and 4½ sq. ft. to lb. ton	*$50.00*
Red Rope Roofing, 250 sq. ft. per roll	*$1.75*

Tarred Paper—

1 ply (roll 400 sq. ft.), ton	*$31.00@$35.00*
2 ply, roll 108 sq. ft.	*57¢*
3 ply, roll 108 sq. ft.	*80¢*
Slater's Felt (roll 500 sq. ft.)	*.76¢*

Sand and Emery—
Flint Paper and Cloth.50&10@—%
Garnet Paper and Cloth....25%
Emery Paper and Cl'h..50&10@60%

Parers— Apple—

Advance	℔ doz.	$4.00
Baldwin	℔ doz.	$4.00
Bonanza Improved	each	$6.50
Daisy	℔ doz.	$4.00
Dandy	each	$7.50
Eureka Improved	each	$20.00
Family Bay State	℔ doz.	$15.00
Improved Bay State	℔ doz.	$36.00
Little Star	℔ doz.	$5.00
New Lightning	℔ doz.	$7.00
Reading 72	℔ doz.	$3.25
Reading 78	℔ doz.	$4.25
Rocking Table	℔ doz.	$6.20
Turn Table '96	℔ doz.	$6.00
White Mountain	℔ doz.	$5.00

Potato—
Saratogs ..... ℔ doz. $7.00
White Mountain..... ℔ doz. $6.00

Picks and Mattocks—
List, Feb. 23, 1899.....75@75&5%
Cronk's Handled Garden Mattock, ℔ doz., No. 2, $2.60; No. 3, $6.40.

Pinking Irons—
See *Irons, Pinking.*

Pins, Escutcheon—
Brass .....50&10@60%
Iron, list Nov. 11, '85..60@60&10%

Pipe, Cast Iron Soil—
Carload lots.
*Standard, 2-6 in.*50&10@50&10&5%
Extra Heavy, 2-6 in......65&10%
Fittings .....70&10@70&10&5%

Pipe, Merchant—
Consumers, Carloads.

	Steel.		*Iron.*	
	Blk.	*Galv.*	*Blk.*	*Galv.*
⅛ & ¼ in.	69%	53%	64.5%	48.5%
⅜ in.	71%	57%	64.5%	56.5%
½ in.	73%	61%	72.5%	62.5%
¾ to 6 in.	77%	67%	72.5%	62.5%
7 to 12 in.	72%	57%	68 %	53 %

Pipe, Vitrified Sewer—
Carload lots.
Standard Pipe and Fittings, 3 to 24 in., f.o.b. factory:
First-class .....85@86%
Second-class 90%
NOTE.—Market irregular.

Pipe, Stove—

	Per 100 joints.	
Edwards' Nested:	C. L.	L. C. L.
5 in., Standard Blue	$6.25	$7.25
6 in., Standard Blue	6.75	7.75
7 in., Standard Blue	7.75	8.75
5 in., Royal Blue	7.00	8.00
6 in., Royal Blue	7.50	8.50
7 in., Royal Blue	8.50	9.50

Planes and Plane Irons—
Wood Planes—
Bench, first qual.....35@35&10%
Bench, second qual...45@45&10%
Molding .....30@30&10%
Bailey's (Stanley R. & L. Co.) 35&2½%
Chapin-Stephens Co.:
Bench, First Quality.....35%
Bench, Second Quality.....45%
Molding and Miscellaneous.....30%
Toy and German.....35%
Union 60%

Iron Planes—
Bailey's (Stanley R. & L. Co.)....35%
Chapin's Iron Planes.....50&10%
Miscellaneous Planes (Stanley R. & L. Co.).....30&5%
Union 60%

Plane Irons—
Wood Bench Plane Irons.... 25@25&10%
Buck Bros.....30%
Chapin-Stephens Co.....25%
Stanley R. & L. Co.....35%
Union 50%
L. & I. J. White.....20&5@25%

Planters, Corn, Hand—
Kohler's Eclipse.....℔ doz. $8.00

Plates—
Felloe .....*lb.* 4@4¼¢
Self-Sealing Pie Plates (R. M. Co.), ℔ doz. $2.00.....50%

Pliers and Nippers—
Button Pliers....75&10@75, 10, 5%
Gas Burner, per doz., 5 in., $1.25 @ $1.30; 6 in., $1.45 @ $1.50.

Gas Pipe..	7	8	10	12-in.
	$2.00	$2.25	$2.75	$3.50

Acme Nippers.....50&5%
Cronk & Carrier Mfg. Co.:
American Button.....75&10%
Cronk's 60%
Stub's Pattern.....50%
Combination and others.....33⅓%
Heller's Farriers' Nippers, Pincers and Tools.....40&5@40&10&5%
The Nettleton Mfg. Co. Reversible Cutting Nippers.....40%
P., S. & W. Tinners' Cutting Nippers 40%
Wm. Schollhorn Co.:
Bernard, 33⅓%; Elm City, 33⅓%; Paragon, 50%; Lodi, 50%.
Swedish Side, End and Diagonal Cutting Pliers.....50%
Utica Drop Forge & Tool Co.:
Pliers and Nippers, all kinds.....40%

Plumbs and Levels—
Chapin-Stephens Co.:
Plumbs and Levels.....30@30&10&5%
Chapin's Imp. Brass Cor..40@40&10%
Pocket Levels.....30@30&10&5%
Extension Sights.....30@30&10&5%
Machinists' Levels.....40@40&10%
Disston's Plumbs and Levels....67½%
Disston's Pocket Levels.....67½%
C. E. Jennings & Co.'s Iron.....33⅓%
C. E. Jennings & Co.'s Iron, Adjustable .....40&7½%
Stanley R. & L. Co.....40%
Stanley's Duplex.....33%
Woods' Extension.....33⅓%

Poachers, Egg—
Buffalo Steam Egg Poachers, ℔ doz., No. 1, $6.00; No. 2, $9.00; No. 3, $9.00; No. 4, $12.00.....50%

Points, Glaziers'—
Bulk and 1-lb. papers.....*lb.* 10¢
½-lb. papers.....*lb.* 9@10½¢
¼-lb. papers.....*lb.* 9½@11¢

Pokes, Animal—
Ft. Madison Hawkeye.....℔ doz. $3.25
Ft. Madison Western.....℔ doz. $4.00

Police Goods—
Manufacturers' Lists...25@25&5%
Tower's 25%

Polish—Metal, Etc—
Glasbrite, No. 2, 5 lb can (powder), each, $1.25; ℔ doz., $12.00; No. 2, 10 lb can (cake), each, $2.50; ℔ doz., $24.00.
Prestoline Liquid, No. 1 (½ pt.), ℔ doz., $3.00; No. 2 (1 qu.), $9.00..40%
Prestoline Paste.....40%
George William Hoffman:
U. S. Metal Polish Paste, 3 oz. boxes, ℔ doz. 50¢; ℔ gro. $4.50, ½ lb boxes, ℔ doz. $1.25; 1 lb boxes, ℔ doz. $2.25.
U. S. Liquid, 8 oz. cans, ℔ doz., $1.25.
Barkeepers' Friend Metal Polish, ℔ doz., $1.75.

Stove—
Black Eagle Benzine Paste, 5 lb cans, ℔ lb 10¢
Black Eagle, Liquid, ⅛ pt. cans, ℔ doz. 75¢
Black Jack Paste, ¾ lb cans, ℔ gr. $9.00
Black Kid Paste, 5 lb can....each, $0.65
Ladd's Black Beauty Liquid, per 100 tins.....$6.75
Joseph Dixon's, ℔ gr. $5.75.....10%
Dixon's Plumbago.....℔ lb 8¢
Fireside .....℔ gr. $2.50
Gem, ℔ gr. $4.50.....10%
Japanese .....℔ gr. $3.50
Jet Black.....℔ gr. $3.50
Peerless Iron Enamel, 10 oz. cans.. ℔ doz. $1.50
Wynn's Black Silk:
Paste, cans, ℔ doz., 5 oz., $0.75; ½ lb, $1.00; 1 lb.....$1.75
Paste, ℔ 5 lb can.....$0.70
Liquid, cans, ℔ doz., 6 oz., $0.75; ½ pt., $1.00; 1 pt.....$1.75
Steel Range Enamel, ℔ doz., ¼ pt., $1.00; ½ pt., $1.25.

Poppers, Corn—
1 qt., Square.....*gro.* $8.00
1 qt., Round.....*gro.* $9.00
1½ qt., Square.....*gro.* $10.00
2 qt., Square.....*gro.* $12.00

Post Hole and Tree Augers and Diggers—
See also *Diggers, Post Hole, &c.*

Posts, Steel—
Steel Fence Posts, each, 5 ft., 42¢; 6 ft., 46¢; 6½ f., 48¢.
Steel Hitching Posts.....each $1.30

Potato Parers—
See *Parers, Potato.*

Pots, Glue—
Enameled .....30&10%
Tinned .....35&10%

Powder—
In Canisters:
Duck, 1 lb.....*each* 45¢
Fine Sporting, 1 lb....*each* 75¢
Rifle, ½-lb.....*each* 15¢
Rifle, 1-lb.....*each* 25¢
In Kegs:
12½-lb. kegs.....$3.50
25-lb. kegs.....$4.50
King's Semi-Smokeless:
Keg (25 lb bulk).....$6.50
Half Keg (12½ lb bulk).....$3.50
Quarter Keg (6¼ lb bulk).....$1.90
Case 24 (1 lb cans bulk).....$8.50
Half case (1 lb cans bulk).....$4.50

King's Smokeless:	Shot Gun.	Rifle.
Keg (25 lb bulk)	$12.00	$15.00
Half Keg (12½ lb bulk)	6.25	7.75
Quarter Keg (6¼ lb bulk)	3.25	4.00
Case 24 (1 lb cans bulk)	14.00	17.00
Half case 12 (1 lb c. bk)	7.25	8.75

Robin Hood Sm'less Shot Gun..50&20%

Presses—
Fruit and Jelly—
Enterprise Mfg. Co.....20@25%
Seal Presses—
Morrill's No. 1, ℔ doz., $20.00.....50%

Pruning Hooks and Shears
See *Shears.*

Pullers, Nail—
Cyclops 50%
Miller's Falls, No. 3, ℔ doz., $12.00...33⅓&10%
Morrill's No. 1, Nail Puller, ℔ doz. $20.00 .....50%
Pearson No. 1, Cyclone Spike Puller, each $30.00.....50%
Scranton, Case Lots:
No. 2B (large).....$5.50
No. 3B (small).....$5.00
Smith & Hemenway Co.:
Diamond B, case lots, ℔ doz., Large, $9.00; Small, $7.50.
Giant No. 1, ℔ doz., $18; No. 1½, $16.50; No. 3, $15.....33⅓%
Staple Pullers, Utica and Davison 60%
Parrot Tack and Stub Puller, ℔ doz., 75c.; ℔ gro., $6.00

Pulleys, Single Wheel—

Inch	1½	1¾	2	3
Awning or Tackle, doz.	$0.30	.45	.60	1.05

Hay Fork, Swivel or Solid Eye, doz., ¼ in., $1.25; 5 in., $1.55

Inch	2	2¼	2½
Hot House, doz.	$0.65	.85	1.20
Inch	1¼	1½	1¾	2
Screw, doz.	$0.16	.19	.23	.30
Inch	1¾	2	2¼	2½
Side, doz.	$0.25	.40	.55	.60
Inch	1½	1¾	2	2½

Stowell's:
Ceiling or End, Anti-Friction..60&10%
Dumb Waiter, Anti-Friction..60&10%
Electric Light.....60%
Side, Anti-Friction.....60&10%

Sash Pulleys—
Common Frame; Square or Round End, per doz, 1¾ and 2 in.....*10@19¢*
Auger Mortise, no Face Plate, per doz., 1¾ and 2 in....*17@19¢*
Acme.....1¾ in., 16¢; 2 in., 19¢
Fox-All-Steel, Nos. 3 and 7, 2 in.... ℔ doz. 50%
Grand Rapids All Steel Noiseless..50%
Ideal .....70&5%
Niagara.....1¾ in., 16¢; 2 in., 19¢
No. 26, Troy..1¾ in., 14½¢; 2 in., 16½¢
Star.....1¾ in., 16¢; 2 in., 19¢
Tackle Blocks—See Blocks.

Pumps—
Cistern 60%
Pitcher Spout.....75&5@75&10%
Wood Pumps, Tubing, &c...45@50%
Barnes Dbl. Acting (low list).....50%
Barnes' Pitcher Spout.....75&10&5%
Contractors' Rubber Diaphragm No. 2, B. & L. Block Co.....$16.00
Daisy Spray Pump.....℔ doz. $6.50
Flint & Walling's Fast Mail Hand, (low list).....55%
Flint & Walling's Fast Mail (low list) 55%
Flint & Walling's Tight Top Pitcher. 75&10&5%
National Specialty Mfg. Co. Measuring, Nos. 2, $6.00; 3, $5.50.....30%
Myers' Pumps (low list).....50%
Myers' Power Pumps.....50%
Myers' Spray Pumps.....50%

Pump Leathers—
Plunger and Lower Valve—Per gro.:

Inch...	2	2¼	2½	2¾
	$2.20	2.50	2.75	3.00
Inch...	3	3¼	3½	3¾	4
	$3.30	3.60	3.85	4.10	4.40

Plunger Cup Leathers—Per 100:

Inch...	2½	3	3½	4
	$2.75	3.85	5.00	6.00

Punches—
Saddlers' or Drive, good..... *doz.* 50@75¢
Spring, single tube, good quality .....$1.75@2.00
Revolving (4 tubes)..... *doz.* $3.50@3.75
Bemis & Call Co.'s Cast St'l Drive.50%
Morrill's Nos. 1AA, 1A, 1B, 1C, $15.00 .....50%
Hercules, 1 die, each $5.00.....50%
Niagara Hollow Punches.....40%
Niagara Solid Punches.....55&10%
Wm. Schollhorn Co.:
Belt and Ticket, Bernard, 33⅓%; Paragon, 50%; Lodi.....50%
Tinners' Hollow, P., S. & W. Co.33⅓%
Tinners' Solid, P., S. & W. Co., ℔ doz., $1.44.....50%

Rail—Barn Door, &c.—
Sliding Door, Painted Iron..... 2½@2¾¢
Sliding Door, Wrought Brass, 1½ in., lb., 36¢ 30%
Allith Mfg. Co.: Reliable Hanger Track 50%
Cronk's:
Double Braced Steel Rail..℔ ft. 2¾ ¢
O. N. T. Rail.....2¼¢
Griffin's:
xxx, ℔ 100 ft., 1 x 3-16 in., $3.00; 1¼ x 3-16 in., 3.50.
Hinged Hanger, ℔ 100 ft., 1 x 3-16 in., $3.10; 1¼ x 3-16 in., $3.80.
Lane's:
Hinged Track, ℔ 100 ft., 1 in., $3.40; 1¼ in., $3.96.
O. N. T., ℔ 100 ft., 1 in., $3.00; 1¼ in., $3.60; 1½ in., $4.00.
Standard, 1¼ in.....℔ 100 ft. $4.00
Lawrence Bros.:
℔ 100 ft. No. 201, $4.00; No. 202, $4.00
New York, 1 x 3-16 in., ℔ 100 ft. $3.00
McKinney's:
Hinged Hanger Rail, ℔ ft., 11¢..50%
None Better.....℔ ft. 3¾ ¢
Standard .....℔ ft. 4 ¢
Myers' Stayon Track.....60&10%
Richards' Mfg. Co.:
Common, 1 x 3-8 in., $3.00; 1¼ x 3-16, $3.25; 1¼ x 3-16, $3.50.
Special Hinged Hanger Rail...60&10%
Lag Screw Rail, No. 65.....50%
Gauge Trolley Track, ℔ ft., No. 31, 9¢; No. 32, 14¢; No. 33, 20¢.
No. 50.....60&10%
Nos. 61, $3.00; 62, $3.25; 63, $3.50; 64, $4.00; 45, $3.25; 46, $3.50; 49, No. 1, $3.25; 49, No. 2, $3.50.
Stowell's:
Cast Rail.....℔ ft. 2¼ ¢
Steel Rail, Plain.....25%
Wrought Bracket, 1 3-16 in.....℔ ft. 3¢
Wrought Bracket, 1½ x 5-16..℔ ft. 7¢
Swett's Hylo, ℔ ft. 11¢.....60%
P. L. B. Steel Rail.....℔ 100 ft. $3.00
No. 0, 1 x 3-16.....℔ 100 ft. $3.00

Rakes—
NOTE.—Many goods are sold at net prices.
Fort Madison Steel Head Lawn....$3.25
Fort Madison Blue Head Lawn....$2.70
Jackson Lawn, 29 and 30 teeth, ℔ doz., net.....$4.25
Cronk's:
New Champion Garden, ℔ doz., 12 teeth, $15.00; 14, $16.50; 16, $18.00..75%
Victor Garden, ℔ doz., 12 teeth, $15.00; 14, $16.50; 16, $18.00.....85%
Queen City Lawn, ℔ doz., 20 teeth, $2.85; 24, $3.00.....net
Anticlog Lawn, ℔ doz.....$1.00
Malleable Garden.....70&10%
Ideal Steel Garden, ℔ doz., 12 teeth, $15.00; 14, $16.00; 16, $18.00.....80%
Kohler's:
Lawn Queen, 20-tooth....℔ doz. $2.90
Lawn Queen, 24-tooth....℔ doz. $3.00
Paragon, 20-tooth.....℔ doz. $2.70
Paragon, 24-tooth.....℔ doz. $2.75
Steel Garden, 14-tooth...℔ doz. $2.40
Malleable Garden, 14-tooth, ℔ doz. $1.75@2.00

Rasps, Horse—
Disston's 75%
Heller Bros.'.....70&5@70&10&5%
Liveright Bros.' Gold Medal.70&10@75%
New Nicholson.....70&10@75%
See also Files.

Razors—
Liana Bo-ras-ic.....60%
Fox Razors, ℔ doz., No. 42, $20.00; No. 44, $20.00; No. 82, Platina, $25.00 } net
Red Devil.....50%
Silberstein:
Carbo Magnetic, $21.00; Griffon, No. 65, $13.50; Griffon, No. 00, $12.00; all other Razors, 40%.

Safety Razors—
Kampfe Bros.:
Star Safety, 25%; Star Interchangeable, 25%; Star Safety Corn, 25%.
Silberstein 40%

Reels, Fishing—
Hendryx:
M 6, Q 6, A 6, B 6, M 9¼, M 16, Q 16, A 16, B 16, 4008, Rubber, Populo, Nickeled Populo.....20%
Aluminum, German Silv., Bronze.25%
1240 N, 124 N.....20%
3004 N, 06 N, 6 RM, G 9.....25%
4 N, 6 PN, 24 N, 26 PN.....20%
2904 P., 33⅓%; 2904 PN., 33⅓%; 0924 N., 33⅓%; 02084 N., 33⅓%; 002904 PN., 33⅓%; 802 N., 33⅓%
966 PN, 2904 N, 974 PN.....25%
5009 PN, 5009 N.....20%
Competitor, 102 P, 102 PN, 202 P, 202 PN, 102 PR, 202 PR.....20%
304 P, 304 PN, 00304 P, 00304 PN.33⅓%

Registers—*List July 1, 1903.*
Japanned, Electroplated and Bronzed 70%
White Porcelain Enamel....60%
Solid Brass or Bronze Metal, 40&10%

Revolvers—
Single Action.....95¢@$1.00
Double Action, except 44 cal.$1.85
Double Action, 44 caliber....$2.00
Automatic $3.25
Hammerless $3.75

Riddles, Hardware Grade
16 in.....*per doz.* $2.50@$2.75
17 in.....*per doz.* $2.75@$3.00
18 in.....*per doz.* $3.00@$3.25

Rings and Ringers—
Bull Rings—

	2	2½	3 *inch.*
Steel	$0.70	0.75	0.80 *doz.*
Copper	$1.00	1.15	1.40 *doz.*

Rea's Improved Self-Piercing, ℔ doz., Copper, 2 in., $1.25; 2½ in., $1.50; 3 in., $1.75.

Hog Rings and Ringers—
Hill's Rings, gro. boxes.$4.00@$4.50
Hill's Ringers, Gray Iron..... *doz.* 50@55¢
Hill's Ringers, Malleable Iron.. *doz.* 70@75¢
Blair's Rings...*per gro.*$4.75@5.25
Blair's Ringers.per doz. $0.60@ .65
Brown's Rings..*per gro.*$5.00@5.50
Brown's Ringers.per doz.$0.60@ .65

Rivets and Burrs—
Copper .....40&2½%
Carriage, Coopers', Tinners, &c.: Black .....70&10%
Metallic Tinned.....70%

Bifurcated and Tubular—
Assorted in Boxes.
Bifurcated, per doz. boxes, pasteboard boxes, 23@25¢; Tin boxes, 29@32¢.
Tubular, per doz. boxes, 50 count, 29@32¢; 100 count, 51@58¢.

Rollers—
Acme, Stowell's Anti-Friction.....50%
Cronk's Stay No. 65, $0.90; No. 50 .....$1.00
Cronk's Brinkerhoff No. 55, $0.60; No. 56.....$0.84
Lane's Stay.....40%
Richards' Stay:
Handy Adj. and Reversible No. 53.75¢
O. K. Adj. and Reversible No. 58.50¢
Lag Screw, Nos. 55 and 57.....50%
Underwriters', Nos. 59, 60.....50%
Reversible, No. 54.....60%
Stowell's Barn Door Stay..℔ doz. $1.00
Swett's Anti-Friction.....50%
Screw and Spike Stay.....℔ doz. 65¢
Hinge Adjustable Stay.....℔ doz. 90¢

Rope—
Manila, 7-16 in. diam. and larger: Pure .....*lb.*, 12½@13¢
Sisal, 7-16 in. diam. and larger: Pure .....*lb.*, 9¼¢
Sisal, 7-16 in. diam. and larger: No. 2 quality.....*lb.*, 8¢
Sisal, Hay, Hide and Bale Ropes, Medium and Coarse: Mixed .....*lb.*, 8¢
Pure .....*lb.*, 9¼¢
Sisal, Tarred, Medium Lath Yarn, Coarse and Untarred: Mixed .....*lb.*, 7@7½¢
Pure .....*lb.*, 8¢
Cotton Rope: Best, ¼-in. and larger...17@18¢
*Medium, ¼-in. and larger.*16@17¢
Common, ¼-in. and larger..10¢
In coils, ½¢ advance.
Jute Rope: Thread, No. 1, ¼-in. & up, lb., 8¼@8½¢
Thread, No. 2, ¼-in. & up, lb., 7¾@8¢
Old Colony Manila Transmission Rope .....℔ lb 17½¢

Wire Rope—
Galvanized .....37½&2½%
Plain .....45&2½%

Ropes, Hammock—
Covert Mfg. Co.:
Jute, 35%; Sisal.....20%

Rules
Boxwood .....60@60&10%
Ivory .....35&10@35&10&5%
Chapin-Stephens Co.:
Boxwood 60%
Flexifold .....27½&10&10%
Ivory .....35@35&10&10%
Miscellaneous .....50@50&10&10%
Stephens' Combination.....55@55&10%
Stationers' .....10@10&10%

Keuffel & Esser Co.:
Folding, Wood....35&10%
Folding, Steel....33⅓&10%
Lufkin's Steel....50&10%
Lufkin's Lumber....60%
Stanley R. & L. Co.:
Boxwood....60%
Ivory....45%
Miscellaneous....60%
Zig Zag....40%
Zig Zag, Pin Joint....42½%
Upson Nut Co.:
Boxwood....60@60&10%
Ivory....35&10@35&10&10%

Sash Balances—
See *Balance, Sash.*

Sash Locks—
See *Locks, Sash.*

Sash Weights—
See *Weights, Sash.*

Sausage Stuffers or Fillers
See *Stuffers or Fillers, Sausage.*

Saw Frames—
See *Frames, Saw.*

Saw Sets—See *Sets, Saw.*

Saw Tools—See *Tools, Saw.*

Saws—
Atkins':
Circular....50%
Band....50&10@60%
Cross Cuts....35&5%
Mulay, Mill and Drag....50%
One-Man Saw, 40%; Wood Saws, 40%; Hand, Compass, &c., 40%.
Chapin-Stephens Co.:
Turning Saws and Frames..30@30&10%
Diamond Saw & Stamping Works:
Sterling Kitchen Saws....30&10&10%
Disston's:
Circular, Solid and Ins'ted Tooth..50%
Band, 2 to 14 in. wide....60%
Band, ⅛ to 1⅜....60%
Crosscuts....45%
Narrow Crosscuts....50%
Mulay, Mill and Drag....50%
Framed Woodsaws....25%
Woodsaw Blades....25%
Woodsaw Rods....25%
Hand Saws, Nos. 12, 99, 9, 16, d100, D8, 120, 76, 77, 8....25%
Hand Saws, Nos. 7, 107, 107½, 3, 0, 00, Combination....30%
Compass, Key Hole, &c....25%
Butcher Saws and Blades....30%
C. E. Jennings & Co.'s:
Back Saws....25%
Butcher Saws....30%
Compass and Key Hole Saws..35&5%
Framed Wood Saws....30%
Hand Saws....20&2½%
Wood Saw Blades....35%
Millers Falls:
Butcher Saws....15&10%
Star Saw Blades....15&10%
Massachusetts Saw Works:
Victor Kitchen Saws....40&10&50%
Butcher Saws Blades....35@40%
Peace & Richardson's Hand Saws...30%
Simonds':
Circular Saws....50%
Crescent Ground Cross Cut Saws..35%
One-Man Cross Cuts....40&10
Gang Mill, Mulay and Drag Saws.50%
Band Saws....50%
Back Saws....25@25&7½%
Butcher Saws....35@35&7½%
Hand Saws....25@25&7½%
Hand Saws, Bay State Brand....45%
Compass, Key Hole, &c..25@25&7½%
Wood Saws....40&7½%
Wheeler, Madden & Clemson Mfg. Co.'s Cross Cut Saws....50%

Hack Saw Blades and Frames—
Atkins' Hack Saw Blades A A A..25%
Disston's:
Concave Blades....25%
Keystone Blades....35%
Hack Saw Frames....30%
Fitchburg File Works, The Best...35%
C. E. Jennings & Co.'s:
Hack Saw Frames, Nos. 175, 180....40&7½%
Hack Saws, Nos. 175, 180, complete, 40&7½%
Goodell's Hack Saw Blades....40&10%
Grimm's Hack Saw Frames..35&5&10%
Griffin's Hack Saw Blades....35&5&10%
Star Hack Saws and Blades....15&10%
Sterling Hack Saw Blades....30&10&5%
Sterling Hack Saw Frames..30&10&10%
Sterling Power Hack Saw Machines, each, No. 1, $25.00; No. 2, $30.00..10%
Victor Hack Saw Blades....25%
Victor Hack Saw Frames....40%

Scroll—
Barnes, No. 7, $15....25%
Barnes' Scroll Saw Blades....40%
Barnes' Velocipede Power Scroll Saw, without boring attachment, $18; with boring attachment, $20....20%
Lester, complete, $10.00....15&10%
Rogers, complete, $3.50 and $4.00..15&10%

Scales—
Family, Turnbull's....50@50&10%
Counter:
Hatch, Platform, ½ oz. to 4 lbs....doz. $5.50
Two Platforms, ½ oz. to 8 lbs....doz. $16.00
Union Platform, Plain..$1.70@1.90
Union Platform, Stpd.$1.85@2.15
Chatillon's:
Eureka....25%
Favorite....40%
Crocers' Trip Scales....50%
Chicago Scale Co.:
The Little Detective....25 lbs 50%
Improved Family No. 2....60%
Portable Platform (reduced list)..50%
Wagon or Stock (reduced list)..25@35%
The Standard Portables....45%
The Standard R. R. and Wagon....50&10%

Scrapers—
Box, 1 Handle....doz. $2.00@2.25
Box, 2 Handle....doz. $2.50@2.60
Ship....Light, $2.00; Heavy, $2.50
Adjustable Box Scraper (S. R. & I. Co.), $6.00....45%
Chapin-Stephens Co., Box....30@30&10&10%

Screws—Bench and Hand
Bench, Iron, doz., 1 in., $2.50@2.75; 1¼, $3.00@3.25; 1¼, $3.50@3.75
Bench Wood....25@25&5%
Hand, Wood....25@25&5%
R. Bliss Mfg. Co., Hand..20&5@20&10%
Chapin-Stephens Co., Hand....25%

Coach, Lag and Hand Rail—
Lag, Cone Point, list Oct. 1, '99....75&15%
Coach, Gimlet Point, list Oct. 1, '99....75&10%
Hand Rail, list Jan. 1, '81....70&10@75%

Jack Screws—
Standard List....75%
Millers Falls....50&10&10%
P., S. & W....50%
Swett Iron Works....75@80%

Machine—
List Jan. 1, '98:
Flat or Round Head, Iron....50@50&10%
Flat or Round Head, Brass....50@50&10%

Set and Cap—
Set (Iron)....75&10&7½%
Set (Steel), net advance over Iron....25%
Sq. Hd. Cap....70&10&7½%
Hex. Hd. Cap....70&10&7½%
Rd. Hd. Cap....50&7½%
Fillister Hd. Cap....60&7½%

Wood—
List July 23, 1903.
Flat Head, Iron....87½&10@..%
Round Head, Iron...85 &10@..%
Flat Head, Brass....82½&10%
Round Head, Brass..80 &10@..%
Flat Head, Bronze...77½&10@..%
Round Head, Bronze.75 &10@..%
Drive Screws....87½&10%

Scroll Saws—
See *Saws, Scroll.*

Scythes—
Per doz.
Grass, No. 1, Plain....$6.25@6.75
Clipper, Bronzed Webb..$6.50@7.00
No. 3 Clipper, Pol'd Webb..$6.75@7.25
No. 6 Clipper and Solid Stee., $7.00@7.50
Bush, Weed and Bramble, No. 2. $6.50@7.00
Grain, No. 1....$8.25@8.75
Bronzed Webb, No. 1..$8.50@9.00
Nos. 3 and 4 Clipper, Grain..$8.75@9.25
Solid Steel, No. 6....$9.25@9.75

Seeders, Raisin—
Enterprise....25@30%

Sets— Awl and Tool—
Fray's Adj. Tool Handles, Nos. 1, $12; 2, $18; 3, $12; 4, $9; 5, $7....50%
C. E. Jennings & Co.'s Model Tool Holders....30%
Millers Falls Adj. Tool Handles, No. 1, $12; No. 4, $12; No. 5, $18....15&10%

Garden Tool Sets—
Ft. Madison Three Plows, Hoe, Rake and Shovel....⅌ doz sets $9.00

Sets, Nail—
Octagon....gro. $3.50@3.75
Buck Bros....27½%
Cannon's Diamond Point, ⅌ gro.$12.40
Mayhew's....⅌ gro. $9.70
Snell's Cor'gated, Cup Pt....⅌ gro. $7.20
Snell's Knurled, Cup Pt....⅌ gro. $7.20
Victor Knurled Cup Pt....⅌ gro. $7.50

Rivet—
Regular list....75@75&10%

Saw—
Atkin's:
Criterion....40%
Adjustable....40%
Disston's Star, Monarch and Triumph....30%
Morrill's No. 1....$15.00
Nos. 3 and 4, Cross Cut....$20.60
No. 5, Mill....$30.00
Nos. 10, 11, 95....$15.60
No. 1 Old Style....$10.00
Special....$16.25
Giant Royal Cross Cut....⅌ doz. $8.00
Royal, Hand....⅌ doz. $4.50
Taintor Positive....⅌ doz. $6.75

Shaving—
Fox Shaving Sets, No. 30....⅌ doz., net, $24.00
Smith & Hemenway Co.'s....60%

Sharpeners, Knife—
Chicago Wheel & Mfg. Co....70%
Pike Mfg. Co.:
Fast Cut Pocket Knife Hones, ⅌ doz....$1.50
Mounted Kitchen Sand Stone, ⅌ doz....$1.50
Natural Grit Carving Knife Hones, ⅌ doz....$3.00
Quick Cut Emery Carving Knife Hones, ⅌ doz....$1.50
Quick Edge Pocket Knife Hones, ⅌ doz....$2.50
(50%)

Skate—
Smith & Hemenway Co., Eureka..20%

Shaves, Spoke—
Iron....doz.$1.10@1.25
Wood....doz.$1.75@2.25
Bailey's (Stanley R. & L. Co.)....45%
Razor Edge (Stanley R. & L. Co.), Iron, 50%; Wood....55%
Chapin-Stephens Co....30@30&10&10%
Goodell's ⅌ doz. $9.00....15&10%
Wood's F1 and F2....50%

Shears—
Cast Iron..	*7*	*8*	*9 in.*	
Best	*$16.00*	*18.00*	*20.00*	*gro.*
Good	*$13.00*	*15.00*	*17.00*	*gro.*
Cheap	*$5.00*	*6.00*	*7.00*	*gro.*

Straight Trimmers, &c.:
Best quality Jap....70@70&10%
Best quality, Nickel..60@60&10%
Fair quality, Jap....80@80&5%
Fair quality, Nickel..75@7"&10%
Tailors' Shears....40@40&10%
Acme Cast Shears....40@40&5%
Heinisch's Tailor's Shears....10%
Wilkinson Shear & Cutlery Co.:
Sheep, 1900 list....30&10&5%
Grass....50&10%
Horse or Mule....50&10%

Tinners' Snips—
Steel Blades....20&5@20&10%
Steel Laid Blades....40&10@50%
Forged Handles, Steel Blades, Berlin....50%
Heinisch's Snips....40%
Jennings & Griffin Mfg. Co.'s, 6½ to 10 in....50%
Niagara Snips....40%
P., S. & W. Forged Handles....20%

Pruning Shears—
Cronk's Hand Shears....33⅓%
Cronk's Wood Handle Shears....33⅓%
Disston's Combined Pruning Hook and Saw, ⅌ doz. $18.00....25%
Disston's Pruning Hook only, ⅌ doz., $12.00....25%
John T. Henry Mfg. Co.:
Pruning Shears, all grades....50%
P., S. & W. Co....30%
Wilkinson Shear & Cutlery Co.:
Hedge, Wilcut Brand....60&10%
Lawn and Border, Wilcut Brand, 60&10%

Sheaves—Sliding Door—
Stowell's Anti-Friction....50%
Reading....40%
R. & E. list....15%
Wrightsville Hatfield Pattern....80%

Sliding Shutter—
Reading list....40%
R. & E. list....10%

Shells—Shells, Empty—
Brass Shells, Empty:
Climax, 10 and 12 gauge....65&10%
Club, Rival, 65&5%; First Quality, 60&5%
Paper Shells, Empty:
New Rapid, 10, 12, 16 and 20 gauge, 25&10%
Climax, 10 and 12 gauge; Acme, 10, 12, 16 and 20 gauge; Ideal, 10, 12, 16 and 20 gauge; Leader grade, 25&5%
Union, League, 12 and 12 gauge; Rival Grade....25%
New Climax, Pedfiance, 10, 12, 14, 16 and 20 gauge; Climax, 14, 16 and 20 gauge....20&5%
Challenge, Monarch, 10, 12, 16 and 20 gauge; League, Union, 14, 16 and 20 gauge; Repeater Grade..20%
Expert, 10, 12, 16 and 20 gauge, 33⅓&5%
Robin Hood, Low Brass....20&5%
Robin Hood, High Brass....30&5%
Indian, for Black Powder....25&5%

Shells, Loaded—
Loaded with Black Powder..40%
Loaded with Smokeless Powder, medium grade....40&5%
Loaded with Smokeless Powder, high grade....40&10&10%
Robin Hood:
Smokeless Robin Hood, Low Brass....50%
Smokeless Comets, High Brass, 50&10&5%
Indian, Black Powder....40&5%
Winchester:
Smokeless Repeater Grade....40&5%
Smokeless Leader Grade...40&10&10%
Black Powder....40%

Shingles, Metal— Per Sq.
Edwards Mfg. Co.:

	Painted.	Galv.
14 x 20	$4.25	$6.00
10 x 14	4.50	6.25
7 x 10	4.75	6.50

Wheeling Corrugating Co.:

	Tin Painted.	Galv.
Dixie, 7 x 10 in	$5.00	$6.75
Dixie, 10 x 14 in	4.50	6.00
Dixie, 14 x 20 in	4.25	5.50

Shoes, Horse, Mule, &c.—
F.o.b. Pittsburgh:
Iron....per keg $4.00
Steel....per keg $3.75
Burden's, all sizes....⅌ keg $3.90

Shot—
25-lb. bag.
Drop, up to B....$1.90
Drop, B and larger....2.15
Buck....2.15
Chilled....2.25
Dust....2.35

Shovels and Spades—
Association List, Nov. 15, 1902..40%

Snow Shovels—
Long Handle....$2.75@3.00
Wood and Mall. D. Handle, $3.25@3.50

Sieves and Sifters—
Hunter's Imitation....gro.$9.50@10.00
Hunter's Genuine....per gro. $12.00@12.50
Buffalo Metallic Blued, R. M. Co., ⅌ gr.

14&16	16&18	18&20
$13.20	$13.50	$14.40

Sieves, Seamless Metallic
Per dozen.

Mesh	*14*	*16*	*18*	*20*
Iron Wire	*$1.05*	*1.05*	*1.10*	*1.20*
Tinned Wire	*$1.15*	*1.15*	*1.20*	*1.30*

Sieves, Wooden Rim—
Nested, 10, 11 and 12 Inch.
Mesh 18, Nested....doz. $0.90@0.95
Mesh 20, Nested....doz. $1.00@1.05
Mesh 24, Nested....doz. $1.50@1.40

Sinks, Cast Iron—
Painted, Standard list:
12 x 12 to 22 x 36 in....60%
20 x 40 to 24 x 50 in....50%
24 x 60 to 24 x 120 in....30%
Barnes' low list:
Up to and including 20 x 36 in..50&5%
20 x 40 to 24 x 50 in....50%
NOTE.—There is not entire uniformity in lists used by jobbers.

Skeins, Wagon—
Cast Iron....70@75&10%
Steel....40@45%

Slates, School—
Factory Shipments.
"D" Slates....50@50&10%
Eureka, Unexcelled Noiseless..60&5 tens
Victor A, Noiseless..60&5 tens &5%

Slaw Cutters—See *Cutters.*

Snaps, Harness—
German....40@40&10%
Covert Mfg. Co.:
Derby, 25%; Yankee, 30&2%; Yankee Roller, 30&2%
High Grade, 40%; Trojan....40%
Jockey....25%
Oneida Community:
Harness Snaps, 1 inch....60&5%
Swivel Snaps....60%
Swivels....50%

Snaths—
Scythe....50%

Snips, Tinners—See *Shears.*

Spoons and Forks—
Silver Plated—
Good Quality....50&10@60&5%
Cheap....60@60&10%
International Silver Co.:
1847 Rogers Bros., 40&10%; Rogers & Hamilton....50&10%
Rogers & Bro., William Rogers' Eagle Brand....50&10%
Anchor, Rogers Brand....60%
Wm. Rogers & Son....60&10%

Miscellaneous—
German Silver....60@60&5%
Cattaraugus Cutlery Co.:
Seneca Silver....50%

Tinned Iron—
Teas....per gro. 45@50¢
Tables....per gro.$0.50@$1.00

Springs— Door—
Bardsley's Spring and Check....40%
Chicago (Coil)....40&10%
Gem (Coil)....20%
Pullman (Coil)....35%
Reliance (Coil)....40&10%
Star (Coil)....30%
Torrey's Rod, 39 in....⅌ doz. $1.10

Carriage, Wagon, &c.—

1¼ in. and Wider:	*Per lb.*
Black	*4@4¼¢*
Half Bright	*4@4¼¢*
Bright	*4½@4¾¢*

Painted Seat Springs:
1½ x 2 x 26....per pr. 42¢
1½ x 3 x 28....per pr. 70¢

Sprinklers, Lawn—
Enterprise....25@30%
Philadelphia No. 1, ⅌ doz. $12; No. 2, $15; No. 3, $20....30%
Pleuger & Henger Mfg. Co.:
Cactus, 65&5%; Japanese, 70&5%; Nationals, 60&5%.

Squares—
Nickel plated.. } *List Jan. 5, 1900.*
Steel and Iron.. } 75@—%
Rosewood Hdl. Try Square and T-Bevels....60&10&10@70%
Iron Hdl. Try Squares and T-Bevels....40&10@40&10&10%
Disston's Try Squares and Bevels, Rosewood Handle, 67½%; Iron Stock and Bevel....20%
Winterbottom's Try and Miter, No. 1, 35%; No. 2....45%

Squeezers, Lemon
Wood, Common, gro., No. 0, $5.25@$5.50; No. 1, $6.25@$6.50.
Wood, Porcelain Lined:
Cheap....doz. $1.00
Good Grade....doz. $1.25
Tinned Iron....doz. $0.75@1.25
Iron, Porcelain Lined...doz. $1.75

Staples—
Barbed Blind....lb. 6@6½¢
Electricians', Association list..80&10&10&10%
Fence Staples, Plain, $2.25; Galvanized....$2.55
Poultry Netting Staples....per lb. 3¼@3½¢

Steels, Butchers'—
Dick's....30%
Foster Bros.'....30%
C. & A. Hoffmann's....40%

Steelyards— ....30@30&10%

Stocks and Dies—
Blacksmiths'....50@50&10%
Curtis Rev'ble Ratchet Die Stock..25%
Derby Screw Plates....25%
Green River....25%
Lightning Screw Plate....25%
Little Giant....25%
Reece's New Screw Plates....25%

Stoners, Cherry—
Enterprise....25@30%

Stones—Oil, &c.
Chicago Wheel & Mfg. Co., 1904 list:
Gem Corundum Oil, Double Grit..60%
Gem Corundum Axe, Single or Double Grit....60%
Gem Corundum Slips....60%
Gem Corundum Razor Hones....50%
Pike Mfg. Co., 1904 list: ⅌ lb.
Arkansas St. No. 1, 3 to 5½ in..$2.00
Arkansas St. No. 1, 5½ to 8 in.$3.50
Arkansas Slips No. 1....$4.00
Lily White Washita, 4 to 8 in.60¢
Rosy Red Washita, 4 to 8 in..60¢
Washita St., Extra, 4 to 8 in.50¢
Washita St., No. 1, 4 to 8 in.40¢
Washita St., No. 2, 4 to 8 in.30¢
Lily White Slips....90¢
Rosy Red Slips....90¢
Washita Slips, Extra....80¢
Washita Slips, No. 1....70¢
Washita Slips, No. 2....40¢
(25%)
India Oil Stones (entire list)....33⅓%
Quickcut Emery and Corundum Oil Stone, Double Grit....33⅓%
Quickcut Emery and Corundum Axe Stone, Double Grit....33⅓%
Quickcut Emery Rubbing Bricks 33⅓%
Hindostan No. 1, R'g'lar, ⅌ lb 8¢
Hindostan No. 1, Small...⅌ lb 10¢
(25%)
Axe Stones (all kinds)....
Turkey Oil Stones, Extra, 5 to 8 in....⅌ lb 80¢
Queer Creek Stones, 4 to 8 in.20¢
Queer Creek Slips....40¢
Sand Stone....8¢

Scythe Stones—

Chicago Wheel & Mfg. Co.:
Gem Corundum, 10 in., $3.00 ℔ gro., 12 in., $10.80.
Norton Alundum Scythe Stones:
Less than 10 gross lots... ℔ gro. $6.00
Lots of 10 gross or more...℔ gro. $4.50
Pike Mfg. Co., 1901 list:
Black Diamond S. S..℔ gro. $12.00
Lamoille S. S.....℔ gro. $11.00
White Mountain S. S.℔ gro. $9.00
Green Mountain S. S..℔ gro. $6.00
Extra Indian Pond S.S.℔ gro. $7.50
No. 1 Indian Pond S.S.℔ gro. $7.00
No. 2 Indian Pond S.S.℔ gro. $4.50
Leader Red End S. S.℔ gro. $4.50
Quick Cut Emery....℔ gro. $10.00
Pure Corundum,.....℔ gro. $18.00
Crescent $7.00
Emery Scythe Rifles, 2 Coat, $8
Emery Scythe Rifles, 3 Coat, $10
Emery Scythe Rifles, 4 Coat, $12
Balance of 1904 list 33⅓%

Stoppers, Bottle—

Victor Bottle Stoppers.....℔ gro. $9.00

Stops— Bench—

Millers Falls.....15&10%
Morrill's, ℔ doz., No. 1, $10.00.....50%
Morrill's, No. 2, $12.50.....50%

Door—

Chapin-Stephens Co.....60@60&10%

Plane—

Chapin-Stephens Co.....20%

Straps— Box—

Cary's Universal, case lots....20&10&10%

Stretchers, Carpet—

Cast Iron, Steel Points, doz. 60@60&10%
Socket .....doz. $1.60
Bullard, ℔ doz.....$4.00
Excelsior Stretcher and Tack Hammer Combined, ℔ doz. $6.00.....20%

Strops, Razor—

Star Diagonal Strop.....25%

Stuffers, Sausage—

Enterprise Mfg. Co.....25@25&7½%
National Specialty Co., list Jan. 1, 1902 .....30&5%

Sweepers, Carpet—

National Sweeper Co.: ℔ doz.
Louis XV, Roller Bearing, Gold Plated $120.00
Hepplewhite, Roller Bearing, Silver Plated.....$72.00
Sheraton, Roller Bearing, N'kel.$60.00
Ye Mission, Roller Bearing, Oxidized Coppered.....$36.00
Transparent, Roller Bearing, Plate Glass top, Nickeled.....$36.00
National Queen, Roller Bearing, Fancy Veneers.....$27.00
Loyal, Roller Bearing, Veneers, Nickeled $25.00
Triple Medal, Roller Bearing, Nickeled $24.00
Marion, Roller Bearing, N'kel.$24.00
Marion Queen, Roller Bearing, Nickeled $24.00
Monarch, Roller Bearing, N'kel.$22.00
Monarch, Roller Bearing, Jap..$20.00
Perpetual, Regular B'r'gs, N'kel.$20.00
Perpetual, Regular B'r'gs, Jap..$18.00
Monarch Extra (17 in, case), Roller Bearing, Nickeled.....$36.00
Monarch Extra (17 in, case), Roller Bearing, Japanned.....$33.00
Auditorium (26 in, case), Roller Bearing, Nickeled.....$54.00
Mammoth (30 in, case), Roller Bearing, Nickeled.....$60.00

NOTE.—Rebates: 50c per dozen on three-dozen lots; $1 per dozen on five-dozen lots; $2 per dozen on ten-dozen lots; $2.50 per dozen on twenty-five-dozen lots.

Streator Metal Stamping Co.:
Eureka Japanned.....℔ doz. $15.00
Model E, Sanitaire.....℔ doz $25.00
Model A, Sterling.....℔ doz. $25.00
Model B, Sterling, Nickeled..... ℔ doz. $23.00
Model B, Sterling, Japanned..... ℔ doz. $21.00
Model C, Sterling.....℔ doz. $21.50
Model D, Sterling.....℔ doz. $19.50

Tacks, Finishing Nails, &c.

New List, May 1, 1905.
American Carpet Tacks.... 90&37½@—%
American Cut Tacks..90&37½@—%
Swedes Cut Tacks..90&37½@—%
Swedes Upholsterers'..90&45@—%
Gimp Tacks.....90&45@—%
Lace Tacks.....90&45@—%
Trimmers' Tacks....90&37½@—%
Looking Glass Tacks....65@—%
Bill Posters' and Railroad Tacks, 90&45@—%
Hungarian Nails.....80&20@—%
Finishing Nails.....70@—%
Trunk and Clout Nails..80@—%

NOTE.—The above prices are for Standard Weights. An extra 5% is given on Medium Weights, and an extra 10&5% is given on light weights.

Miscellaneous—

Double Pointed Tacks..... 90&5 or 6 tens
See also Nails, Wire.

Tanks, Oil— Each.

Emerald, R. M. Co.....30-gal. $3.40
Emerald, R. M. Co.....60-gal. $4.25
Queen City, R. M. Co.....30-gal. $3.65
Queen City, R. M. Co.....60-gal. $4.50

Tapes, Measuring—

American Asses' Skin ..50@—%
Patent Leather.....25@40&5%
Steel .....33 1-3&5%
Chesterman's .....25@25&5%
Keuffel & Esser Co.:
Favorite, Ass Skin.....40&10@50%
Favorite, Duck and Leather..... 25&5&25&10%
Metallic and Steel, lower list, 35@35&5%; Pocket, 35@35&5%.

Lufkin's:
Asses' Skin.....40&10@50%
Metallic .....30@30&5%
Patent Bend, Leather....25&5@25&10%
Pocket .....40@40&5%
Steel .....33⅓@35%
Wiebusch & Hilger:
Chesterman's Metallic, No. 34L, etc. 25%
Chesterman's Steel, No. 1038L, etc. 35%

Teeth, Harrow—

Steel Harrow Teeth, plain or headed, ⅝-inch and larger... per 100 lbs. $2.75@$3.00

Thermometers—

Tin Case.....80&10@80&10&5%

Ties, Bale—Steel Wire—

Single Loop.....80&2½%
Monitor, Cross Head, &c....70%

Brick Ties—

Niagara Brick Ties.....25&10%

Tinners' Shears, &c.—

See *Shears, Tinners', &c.*

Tinware—

Stamped, Japanned and Pieced, sold very generally at net prices.

Tire Benders, Upsetters, &c.

See *Benders and Upsetters, Tire.*

Tools—Coopers'—

L. & I. J. White.....20@20&5%

Hay—

Myers' Hay Tools.....50%
Stowell's Hay Carriers, 50%; Hay Forks, 50%; Fork Pulleys, 50%.

Miniature—

Smith & Hemenway Co.'s, Davidson 25%

Saw—

Atkins' Cross Cut Saw Tools.....40%
Simonds' Improved.....33⅓
Simonds' Crescent.....25%

Ship—

L. & I. J. White.....25%

Transom Lifters—

See *Lifters, Transom.*

Traps—Fly—

Balloon, Globe or Acme, doz. $1.15@$1.25; gro.....$11.50@12.00
Harper, Champion or Paragon, doz. $1.25@1.40; gro. $13.00@15.50

Game—

Imitation Oneida.....75@75&5%
Newhouse .....45@45&5%
Hawley & Norton.....65%
Victor .....70&10%
Oneida Community Jump.....50%

Mouse and Rat—

Mouse, Wood, Choker, doz. holes 8½@9¢
Mouse, Round or Square Wire, doz. 85@90¢
Marty French Rat and Mouse Trap (Genuine):
No. 1, Rat, ℔ doz., $13.25; case of 24 .....$11.50 doz.
No. 3, Rat, ℔ doz., $6.50; case of 50 .....$5.75 doz.
No. 3½, Rat, ℔ doz. $5.25; case of 72 .....$4.70 doz.
No. 4, Mouse, ℔ doz. $3.85; case of 150 .....$3.00 doz.
No. 5, Mouse, ℔ doz. $3.00; case of 150 .....$2.25 doz.

Trimmers, Spoke—

Wood's M 1.....50%

Trowels—

Disston Brick and Pointing.....25%
Disston Plastering.....20%
Disston "Standard Brand" and Garden Trowels.....50%
Kohler's Steel Garden Trowels, ℔ gro., 5 in., $4.80; 6 in., $6.00.
Never-Break Steel Garden Trowels.. ℔ gro. $6.00
Rose Brick and Plastering.....25&5%
Woodrough & McFarlin, Plastering.25%

Trucks, Warehouse, &c.—

B. & L. Block Co.:
New York Pattern.....50&10%
Western Pattern.....60&10%
Handy Trucks.....℔ doz. $16.00
Grocery .....℔ doz. $15.00
Daisy Stove Trucks, Improved Pattern .....℔ doz. $18.50
McKinney Trucks.....each $10.00
Model Stove Trucks.....℔ doz. $18.50

Tubs, Wash—*No. 1 2 3*

Galvanized, per doz. $4.25 4.75 5.25
Galvanized Wash Tubs (R. M. Co.):
No. 1 2 3 10 20 30
Per doz., net.$5.70 6.30 7.20 6.60 7.20 8.12

Twine, Miscellaneous—

Flax Twine:
No. 9, 1/4 and 1/2-lb. Balls .22@24¢
No. 12, 1/4 and 1/2-lb. Balls .20@21¢
No. 18, 1/4 and 1/2-lb. Balls .17@19¢
No. 24, 1/4 and 1/2-lb. Balls .16@18¢
No. 36, 1/4 and 1/2-lb. Balls .15@17¢
Chalk Line, Cotton 1/4-lb. Balls .....25@30¢
Cotton Mops, 6, 9, 12 and 15 lb. to doz.....10@18¢
Cotton Wrapping, 5 Balls to lb., according to quality...1½@22¢
American 2-Ply Hemp, 1/4 and 1/2-lb. Balls.....13½@14½¢
American 3-Ply Hemp, 1-lb. Balls .....14½@15½¢
India 2-Ply Hemp, 1/4 and 1/2-lb. Balls (Spring Twine) .9½@10½¢
India 3-Ply Hemp, 1-lb. Balls 9½@10½¢
India 3-Ply Hemp, 1½-lb. Balls. 9@10¢
2, 3, 4 and 5-Ply Jute, 1/2-lb. Balls .....11@13¢
Mason Line, Linen, 1/2-lb. Bls. 46¢
No. 28½ Mattress, 1/4 and 1/2-lb. Balls, according to quality, 30@60¢
Wool, 3 to 6 ply....B 7¾¢; A 9¢

Vises—

Solid Box.....60%

Parallel—

Athol Machine Co.:
Simpson's Adjustable.....40%
Standard 40%
Amateur 25%
Columbian Hdw. Co.....40%
Emmert Universal:
Pattern Makers' No. 1, $15.00; No. 2, $12.50.
Machinist and Tool Makers' No. 4A, $12.50; No. 6A, $10.00; No. 10A, $22.50.
Presto Quick Acting, Adjustable Jaw, 25@25&10%; Solid Jaw, 35@35&10%
Tiger Machinists'.....40%
Fisher & Norris Double Screw, net, each, Nos. 2, $10.50; 3, $16.00; 4, $20.50; 5, $27.00.
Hollands':
Machinists' .....40@45&5%
Keystone .....65@65&10%
Lewis Tool Co.:
Adjustable Jaw.....30%
Monarch, 50%; Solid Jaw.....50%
Massey Vise Co.:
Clincher 40%
Perfect, 15%; Lightning Grip.....15%
Merrill's 20%
Millers Falls Oval Slide Pattern.60&10%
Parker's:
Victor, 20@25%; Regulars.....20@25%
Vulcan's .....40@45%
Combination Pipe.....55@60%
Prentiss .....20@25%
Snediker's X. L.....33⅓%
Stephens' 33⅓%

Saw Filers—

Disston's D 3 Clamp and Guide, ℔ doz., $24.00, 30%; Clamps.....30%
Perfection Saw Clamps, ℔ doz....$4.50
Reading 60%
Wentworth's Rubber Jaw, Nos. 1, 2 and 3.....50%

Wood Workers—

Massey Vise Co.:
Lightning Grip, 15%; Perfect.....15%
Wyman & Gordon's Quick Action, 6 in., $6.00; 9 in., $7.00; 14 in., $8.00.

Miscellaneous—

Holland's Combination Pipe..60@60&5%
Massey's Quick Action Pipe.....40%
Parker's Combination Pipe:
87 Series, 60%; 187 Series, 60&5%; No. 870, 40%.

Wads—*Price per M.*

B. E., 11 up .....60¢
B. E., 9 and 10.....70¢
B. E., 8.....80¢
B. E., 7.....80¢
P. E., 11 up.....$1.00
P. E., 9 and 10..... 1.25
P. E., 8..... 1.50
P. E., 7..... 1.50
Ely's B. E., 11 and larger.$1.70@1.75
Ely's P. E., 12 to 20....$3.00@3.25

Dis. 15%

Ware, Hollow— Cast Iron, Hollow—

Stove Hollow Ware:
Enameled .....45&10@50%
Ground .....50@50&10%
Plain or Unground...60@60&5%
Country Hollow Ware, per 100 lbs. $2.75
White Enameled Ware:
Maslin Kettles.....65@65&10%
Covered Wares:
Tinned and Turned.....35&10%
Enameled .....45&10%
See also *Pots, Gluc.*

Enameled—

Agate Nickel Steel Ware.....60%
Iron Clad Ware.....70&10%
Lava, Enameled.....40&10%
Never Break Enameled.....50%

Tea Kettles—

Galvanized Tea Kettles:
Inch..... 6 7 8 9
Each .....45¢ 50¢ 55¢ 65¢

Steel Hollow Ware—

Avery Spiders and Griddles..65@65&5%
Avery Kettles.....60%
Porcelained .....50&5@50&10%
Never Break Spiders and Griddles.. 65&5%
Never Break Kettles.....60%
Solid Steel Spiders and Griddles.65&5%
Solid Steel Kettles..... .....60%

Warmers, Foot—

Pike Mfg. Co., Soapstone....40@40&10%

Washboards—

Solid Zinc: ℔ doz.
Crescent, family size, bent frame.$3.70
Red Star, family size, stationary protector $3.70
Double Zinc Surface:
Saginaw Globe, family size, stationary protector.....$3.25
Cable Cross, family size, stationary protector.....$3.40
Single Zinc Surface:
Naiad, family size, open back, perforated $2.90
Single Saginaw Globe.....$2.75
Brass Surface:
Brass King, Single Surface, open back Star, ...$3.65
Nickel Plate Surface:
No. 1001 Nickel Plate, Single Surface $3.65
Glass Surface:
Glass King, Single Surface, open back $3.65
Enamel Surface:
Enamel King, Single Surface, ventilated back.....$3.65

Washers—Leather, Axle—

Solid .....50&10@80&10&10%
Patent .....90@90&5%
Coil: ¼ ½ ¾ 1¼ Inch.
10¢ 11¢ 12¢ 14¢ per box

Iron or Steel—

Size bolt.... 5-16 ⅜ ½ ⅝ ¾
Washers....$5.60 4.70 3.40 3.20 3.00
The above prices are based on $5.80 off list.

In lots less than one keg add ½¢ per lb.; 5-lb. boxes add ½¢ to list.

Cast Washers—

Over ¼ inch, barrel lots..... per lb. 1¾@2¢

Weather Strip—

Flexible Felt—

Lined, per 100 ft., $2; $3; $4.....40&10%
Moore's Unlined, per 100 ft., $2; $3; $4 .....50&10%

Wedges—

Oil Finish.....lb. 2.70@2.80¢

Weights—Hitching—

Covert Mfg. Co.....30&2%

Sash—

Per ton, f.o.b. factory:
Eastern District...$27.50@$28.50
Southern Territory.$23.00@$24.00
Western and Central Districts .....$24.00@$27.00

Wheels, Wash—

8-in., $1.55; 10-in., $2.00; 12-in., $2.50; 14-in., $4.00.

Wire and Wire Goods—

Bright and Annealed:
6 to 9.....80%
10 to 18.....80&2½%
19 to 26.....80&7½%
27 to 36.....80&2½%
Galvanized:
6 to 9.....75&5%
10 to 14.....75&7½%
15 to 16.....72½&10&2½%
19 to 26.....72½%
27 to 36.....72½%
Coppered:
6 to 9.....75&5%
10 to 14.....75&7½%
15 to 18.....72½&10&2½%
19 to 26.....75&10&5%
27 to 36.....75%
Tinned:
6 to 14.....75&10&2½%
15 to 18.....75&7½%
Annealed, Steel and Tinned, on Spools .....70&10@75&10%
Brass and Copper on Spools... 60&10@65&10%
Spooled Wire, Retailers' Assortments, per box.....$2.25@$2.50
Brass .....Net list.
Cooper .....Net list.
Cast Steel Wire.....50%
Wire Clothes Line, see Lines.
Wire Picture Cord, see Cord.

Bright Wire Goods—

List June 24, '03.....90@90&10%
Brass Cup Hooks and Brass Screw Hooks.....85@—%

Wire Cloth and Netting—

Galvanized Wire Netting..... 80&5@80&10%
Painted Screen Cloth, 100 ft., $1.25
Standard Galv. Hardware Grade:
Nos. 2, 2½ & 3 Mesh, sq. ft. 3¢
Nos. 4 and 5 Mesh, sq. ft..3½¢
No. 6 Mesh, sq. ft.....3½¢
No. 8 Mesh, sq. ft.....4¢

Wire, Barb—See *Trade Report*

Wrenches—

Agricultural .....40@40&5%
Alligator or Crocodile..70&10@75%
Baxter Pattern S Wrenches... 70&5@70&10%
Drop Forged S.....45@45&5%
Acme .....60&10%
Alligator Pattern, 70%; Bull Dog..70%
Bemis & Call's:
Adjustable S, 40%; Adjustable S Pipe, 40%; Briggs Pattern, 40%; Combination Bright, 40%.
Steel Handle Nut.....50%
Combination Black.....40&5%
Merrick Pattern.....50%
Boardman's 40%
Coes' Genuine Knife Hdl..40&10&5&5%
Coes' Genuine Steel Hdl..40&10&5&5%
Coes' Genuine Key Model..40&10&5&5%
Coes', Genuine Hammer Handle..... 40&10&5&5%
Coes' "Mechanics'"...40&10&10&5&5%
Donohue's Engineer.....40&10%
Eagle 70%
Elgin Wrenches, ℔ doz.....$6.25
Elgin Rethreading Attachment, only with one die, ℔ doz.....$6.25
Elgin Extra Dies, ℔ doz.....$3.00
Elgin Extra Jaws, ℔ doz.....$1.75
Elgin Monkey Wrench Pipe Jaws, ℔ doz.....$2.15
Gem Pocket.....30%
Hercules 10%
W. & B. Machinist:
Case lots.....50&5%
Less than case lots.....50%
W. & B. Railroad Special:
Case lots.....50%
Less than case lots.....40&10&5%
Solid Handles, P., S. & W.....50&5%
Stillson 65%
Vulcan Chain.....50%

Fruit Jar—

Triumph Fruit Jar Wrench, 5 gross lots, ℔ gross, $7.50; ℔ doz.....$0.80

Wrought Goods—

Stables, Hooks, &c., list March 17, '92.....90@90&10%

Yokes, Ox, and Ox Bows—

Fort Madison's Farmers' & Freighters'..... list net

Zinc—

Sheet.....per 100 lb., $8.25@8.50

CURRENT METAL PRICES.

The following quotations are for small lots. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL—

Bar Iron from store—

Refined Iron:

1 to 1¼ in. round and square	₩ ℔ 2.20¢
1½ to 4 in. x ⅝ to 1 in.	₩ ℔ 2.20¢
1½ to 4 in. x ¼ to 5-16	₩ ℔ 2.40¢
Rods—⅜ and 11-16 round and square	₩ ℔ 2.40¢
Angles:	Cts ₩ ℔
3 in. x ¼ in. and larger	2.40¢
(except 3½ in. and 4 x ¼ 2.50¢)	
3 in. x 3-16 in. and ⅛ in.	2.65¢
1½ to 2½ in. x ⅛ in.	2.45¢
1½ to 2¾ in. x 3-16 in. and thicker	2.40¢
1 to 1¼ in. x 3-16 in.	2.45¢
1 to 1¼ x ⅛ in.	2.50¢
⅝ x ⅛ in.	2.65¢
¾ x ⅛ in.	2.75¢
⅝ x ⅛ in.	3.80¢
⅜ x 3-32 in.	4.30¢
Tees:	
1 in.	2.75¢
1¼ in.	2.55¢
1½ to 2½ in.	2.45¢
3 in. and larger	2.50¢
Beams	2.40¢
Channels, 3 in. and larger	2.40¢
Bands—1½ to 6 x 3-16 to No. 8	2.45¢
"Burden's Best" Iron, base price	3.05¢
Burden's "H. B. & S." Iron, base price	3.00¢
"Ulster"	3.10¢
Norway Bars	3.40¢
Norway Shapes	3.80¢

Merchant Steel from Store—

	per ℔
Bessemer Machinery	2.10¢
Toe Calk, Tire and Sleigh Shoe	2.50@3.00¢
Best Cast Steel, base price in small lots	7¢

Sheets from Store—

Black

	One Pass, C.R. Soft Steel.	R. G. Cleaned.
No. 14	₩ ℔ 2.90	3.00¢
Nos. 18 to 21	₩ ℔ 3.05	3.10¢
No. 27	₩ ℔ 3.20	3.50¢
No. 28	₩ ℔ 3.30	3.60¢

Russia, Planished, &c.

Genuine Russia, according to assortment	₩ ℔ 11¾@14¢
Patent Planished	₩ ℔ A, 10¢; B, 9¢, net.

Galvanized.

Nos. 14 to 16	₩ ℔, 3.25¢
Nos. 22 to 24	₩ ℔, 3.65¢
No. 27	₩ ℔, 4.10¢
No. 28	₩ ℔, 4.35¢

No. 20 and lighter 36 inches wide, 25¢ higher.

Tin Plates—

American Charcoal Plates (per box.)

A.A.A. Charcoal:	
IC, 14 x 20	$6.60
IX, 14 x 20	7.85
A. Charcoal:	
IC, 14 x 20	$5.65
IX, 14 x 20	6.75

American Coke Plates—Bessemer—

IC, 14 x 20.....108 ℔	$4.65
IX, 14 x 20	5.65

American Terne Plates—

IC, 20 x 28 with an 8 lb. coating	$9 00
IX, 20 x 28 with an 8 lb. coating	11.00

Seamless Brass Tubes—

List December 4, 1905. Base price 25c.

Brass Tubes, Iron Pipe Sizes—

List December 4, 1905. Base price 25c.

Copper Tubes—

List December 4, 1905. Base price 29c.

Brazed Brass and Bronze Tubes—

List June 6, 1898. Discount 17½%.

High Brass Rods—

Discount 10%.

Roll and Sheet Brass—

List June 6, 1898. Discount 5%.

METALS—

Tin—

Straits Pig ₩ ℔ 44 @44¼¢

Copper—

Lake Ingot	₩ ℔ 23¼@24¼¢
Electrolytic	₩ ℔ 22¾@23¾¢
Casting	₩ ℔ 22 @23 ¢
Sheet Copper Hot Rolled, 16 oz.	₩ ℔ 27¢
" " 14 "	" " 28¢

Sheet Copper Cold Rolled, 1¢ ₩ ℔ advance over Hot Rolled.
Sheet Copper Polished 20 in. wide and under, 1¢ advance over Cold Rolled.
Sheet Copper Polished over 20 in. wide, 2¢ advance over Cold Rolled.
Bottoms, Pits and Flats ₩ ℔ 3.¢ basis
Planished Copper, 1¢ ₩ ℔ more than Polished.

Spelter—

Western ₩ ℔ 7 @ 7¼¢

Zinc.

No. 9, base, casks, ₩ ℔ 8.50¢ | Open ₩ ℔ 9.00¢

Lead.

American Pig ₩ ℔ 6¾@7¼¢
Bar ₩ ℔ 7⅜@7⅝¢

Solder.

½ & ½, guaranteed ₩ ℔ 26½@27 ¢
No. 1 ₩ ℔ 24 @24½¢
Refined Per. Lb. 20¾@21¾¢

Prices of Solder indicated by private brand vary according to composition.

Antimony—

Cookson ₩ ℔ 27@28¢
Halletts 26@27¢
Other Brands 24@25¢

Aluminum—

No. 1 Aluminum (guaranteed over 99% pure), in ingot for remelting:
Small lots 40c
100-℔ lots 38c

Old Metals.

Dealers' Purchasing Prices Paid in New York

	Cents
Copper, Heavy Cut and Crucible	₩ ℔ 19.00@20.00¢
Copper, Heavy and Wire	₩ ℔ 18.25@19.50¢
Copper, Light and Bottoms	₩ ℔ 17.50@18.00¢
Brass, Heavy	₩ ℔ 13.50@14.00¢
Brass, Light	₩ ℔ 11.50@12.00¢
Heavy Machine Composition	₩ ℔ 18.00@19.00¢
Clean Brass Turnings	₩ ℔ 13.00@13.50¢
Composition Turnings	₩ ℔ 15.00@15.75¢
Lead, Heavy	₩ ℔ 5.40@ 5.60¢
Tea Lead	₩ ℔ 5.00@ 5.30¢
Zinc Scrap	₩ ℔ @ 4.50¢
No. 1 Yard Wrought, Long	$17.00@17.50
No. 1 Yard Wrought, Short	$16.00@16.75
Wrought Pipe	$12.50@13.00
No. 1 Machinery Cast	$15.50@16.00
Stove Plate	$12.50@13.25

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